THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1680.] LONDON, JULY 23, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.

THOMAS ALLAN & SONS,

Bonlea Foundry,

SOUTH STOCKTON-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

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LIMITED.

LANEMARK CANNEL AND GAS COALS.

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THE ONLY MAKERS OF

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Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

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ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

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"THE STIDDGREEN."

Absolutely the Best Slot-Meter Obtainable.

Guaranteed for 5 Years.

Telegraphic Address: "Stidder, London."

The Silver Coin Meter takes **SHILLINGS AND SIXPENCES,** and the Bronze Coin Meter takes **PENNIES AND HALFPENNIES** in the same Slot, and supplies proportionate quantities of Gas.

Prepayment Indicator marked in single foot spaces; consequently errors of adjustment are visible upon the insertion of the first Coin, and may be instantly corrected.

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Price changing to any fraction of a foot *in situ*—no change wheels.

No increase in height or breadth of Meter. Mechanism extremely simple.

Is compact and handsome; cannot be tampered with by any amount of ingenuity; whilst its mechanism is the simplest and strongest in the market.

WE INVITE YOU TO TEST THIS METER.

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Office and Works: **AQUINAS ST., STAMFORD ST., LONDON, S.E.**

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SAWER & PURVES, Garratt St. Works, MANCHESTER,

MANUFACTURERS OF

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THE UNVARYING WATER-LINE GAS-METER,

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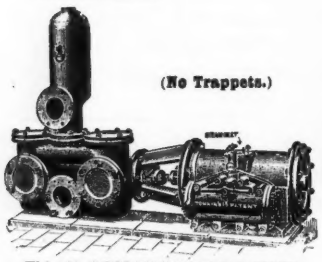


Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

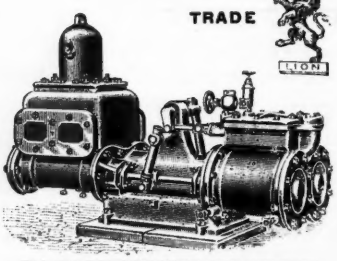


Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

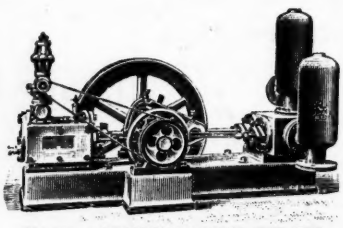


Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

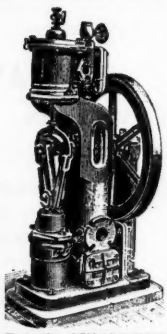


Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

JOSEPH EVANS & SONS, Hydraulic Engineers,

WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

FALK, STADELMANN, & Co., Ld.,

VERITAS LAMP WORKS, FARRINGDON ROAD, LONDON, E.C.

THE "UNICORN" GAS-STOVE. (REGISTERED.)

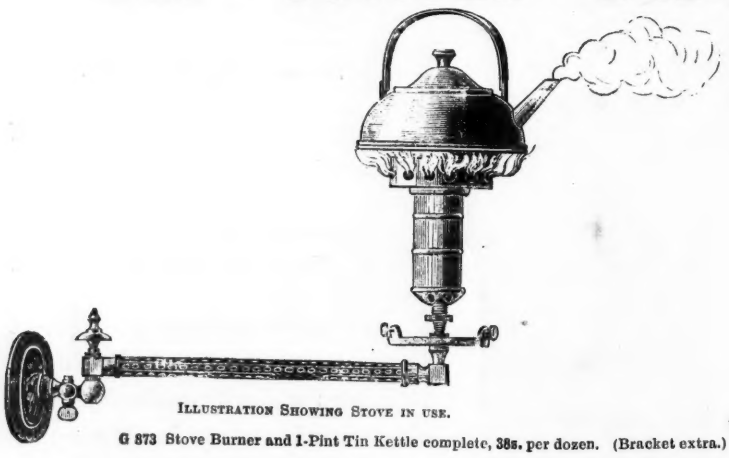
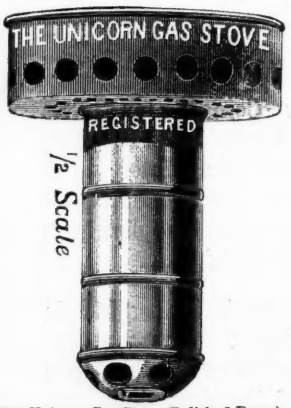


ILLUSTRATION SHOWING STOVE IN USE.

G 873 Stove Burner and 1-Pint Tin Kettle complete, 38s. per dozen. (Bracket extra.)



G 869 Unicorn Gas-Stove (Polished Brass) 24s. per dozen.

G 870
Cast Unicorn Burner
5s. per dozen.

THIS STOVE is **invaluable** for **Bedrooms** and **Kitchens. No other Gas-Stove equals it for quickness.** It simply slips over the Burner which is supplied with the Stove, and which thereby is at once converted into an atmospheric burner. When the Burner is not needed for the Stove, it remains in the bracket, and acts as an ordinary Comet Burner. The Kettle has a sunk well, and rests securely on the Stove, **which must always be lighted from the top.**

WILL BOIL A PINT OF WATER IN A FEW MINUTES.

STOVE, BURNER, AND KETTLE PACKED COMPLETE IN A NEAT CARDBOARD BOX.

G 871 Unicorn Kettle, 1 pint, polished Tin, 9s. per dozen.
G 872 " " " Copper, 30s. per dozen.

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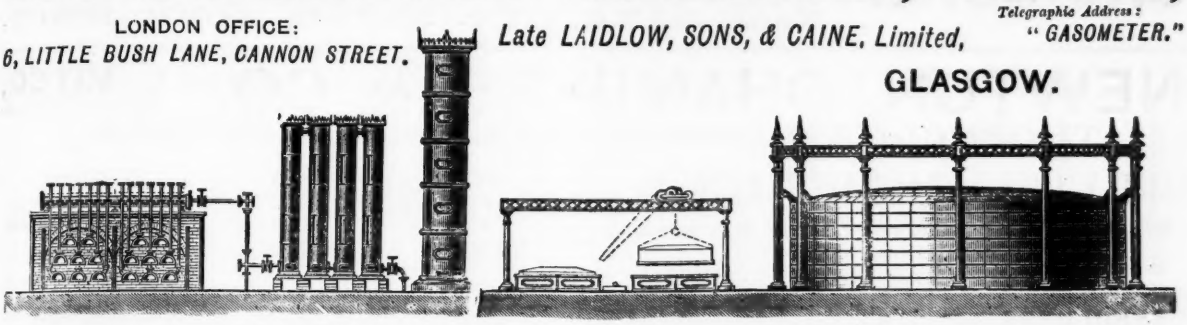

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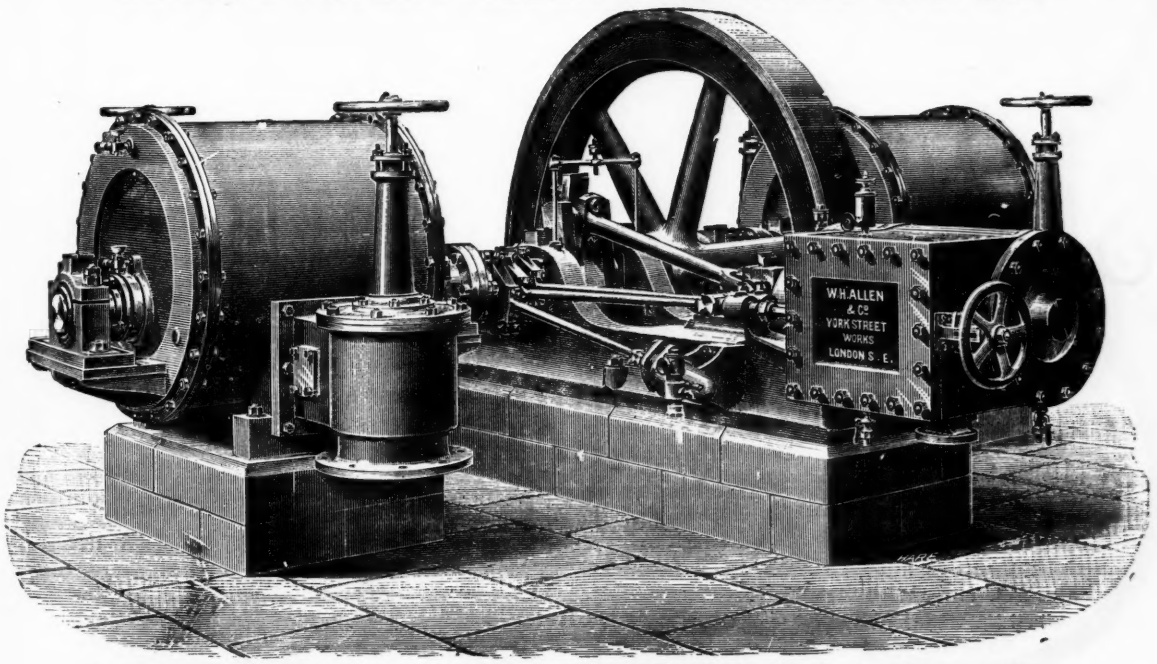

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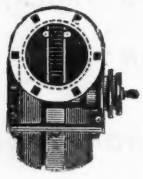

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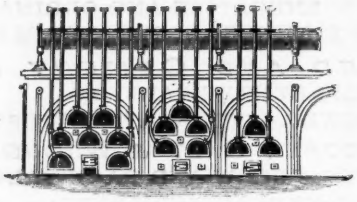

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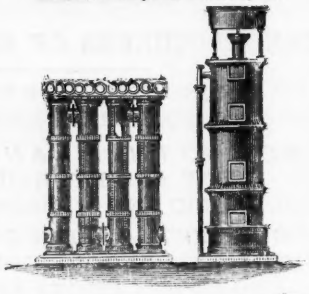

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for working Purifiers,
Also Bye-Pass & Stop Valves.

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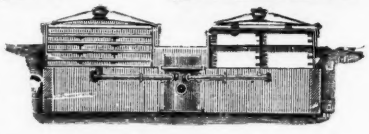

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GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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GAS CONDENSER
SUITABLE FOR GASWORKS
OF ALL SIZES,
AND FOR ANY CLIMATE
OVER 100 ERECTED

MAKERS
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GASHOLDERS
OF EVERY SIZE
AND TYPE

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HUNT'S
PATENT
WASHER.
IS THE ONLY APPARATUS
NECESSARY BETWEEN THE
CONDENSER & PURIFIERS,
IT REQUIRES NO
MOTIVE POWER

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FOR
THE "MAXIM"
CARBURETTER,
A MOST SUCCESSFUL
ENRICHER.
BY WHICH THE USE OF
CANNEL COAL IS AVOIDED
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CUTLER'S
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IS THE BEST APPLIANCE,
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OF ICE IN GASHOLDER CUPS,
IT IS IN USE AT MANY
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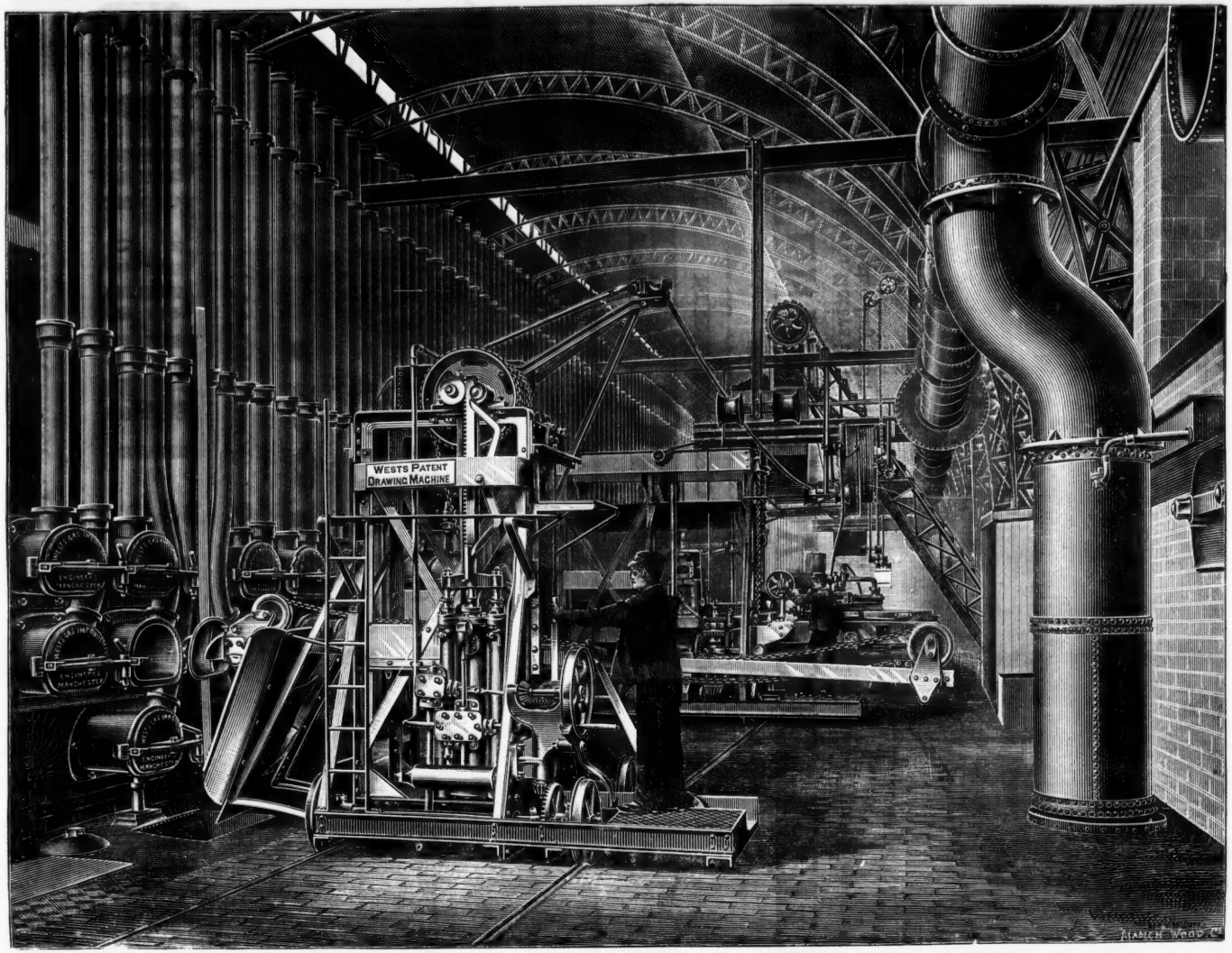

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

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OVER

560,000

LINEAL FEET

OF

RETORTS DAILY

ARE CHARGED AND DRAWN BY

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Irish Incandescent Gas-Light Co.,

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HAVING ACQUIRED

The Sole License for the Sale of

INCANDESCENT GAS-LAMPS

(Welsbach System)

In Ireland,

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THE MANAGER,

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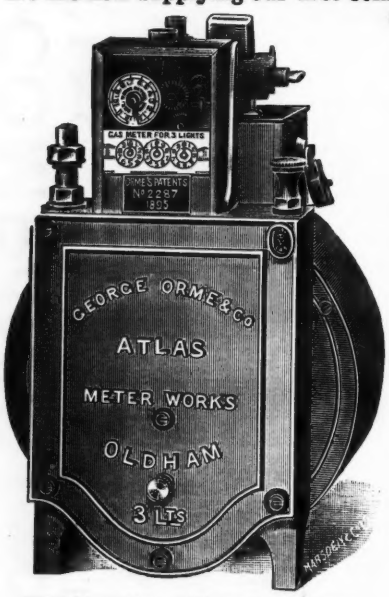
GEORGE ORME & CO.

ATLAS METER WORKS, OLDHAM.

Manufacturers of

ORME'S PATENT IMPROVED COIN METER.

We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.



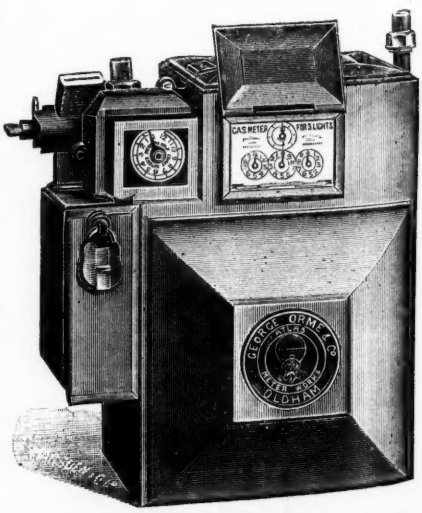
WET COIN METER IN CAST-IRON CASE.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



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Any further Particulars sent upon application.

Telegraphic Address: "ORME, OLDHAM." Telephone: No. 93, Oldham.

IMPROVEMENTS IN STREET LIGHTING.
HIGHEST EFFICIENCY WITH GREATEST ECONOMY.

LIGHTING AUTHORITIES, GAS ENGINEERS, & GAS MANAGERS

Are invited to inspect the

INCANDESCENT GAS-LIGHT

Which has now been successfully adapted to the purposes of

STREET LIGHTING,

THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.

Two forms of Burners are specially recommended for Street Lighting.

The "C" BURNER,

Giving a Light of 60 Candles, with a Consumption of 3½ Cubic Feet of Gas an Hour.

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Giving a Light of 25 to 30 Candles, with a Consumption of 2¼ Feet of Gas an Hour.

This System of Lighting meets the Requirements of all the Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting, without any increase of expenditure.

THE INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—

(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours.

The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.

After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4¾d., and a large increase in the Illumination of the Street.

(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.

The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns fitted with flat-flame burners.

The net result therefore appears to be that, by the use of the Incandescent Gas-Light System, the saving effected is over 50s. per annum per lamp, and at the same time more than double the light is obtained.

It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

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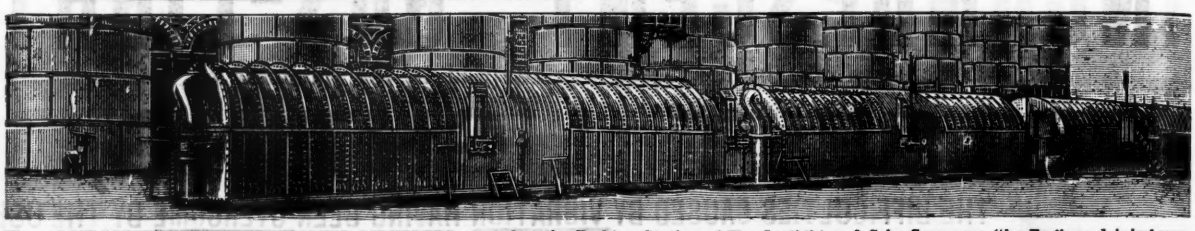
PATENT "STANDARD" WASHER-SCRUBBER

☛ **492** of these Machines (capable of dealing with **472,540,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

MARSHALL'S PATENT BATTERY CONDENSER & SCRUBBER.

This apparatus being made in sections, the capacity can be easily and cheaply made proportionate to increased make of Gas. Other advantages are: Large and effective cooling area on small ground space, slow speed, no repairs required, high strength liquor obtained, &c.

MARSHALL'S PATENT TAR-EXTRACTOR.

Extracts practically all the Tar without choking up, and gives minimum back-pressure.

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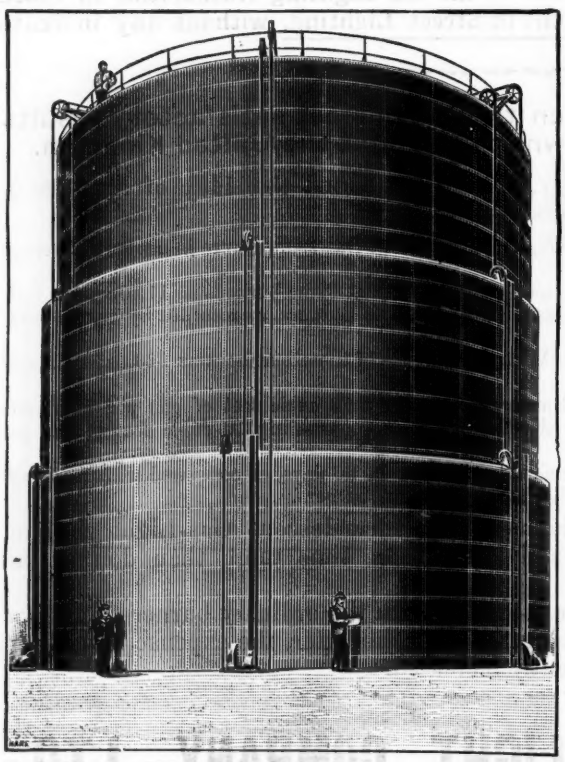

From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

GAS-WORKS CONTRACTORS,

STOCKTON-ON-TEES.

Pease's Patent Roped Gasholders

THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

MAY BE SEEN AT MANY PLACES.

Send for Catalogue if requiring increased Storage.

The security afforded by this System is shown by the working of the Three-Lift Holder, the subject of this engraving; not only was the Holder unaffected by the recent heavy gales, but also the recorded strain on the Ropes was remarkably small.

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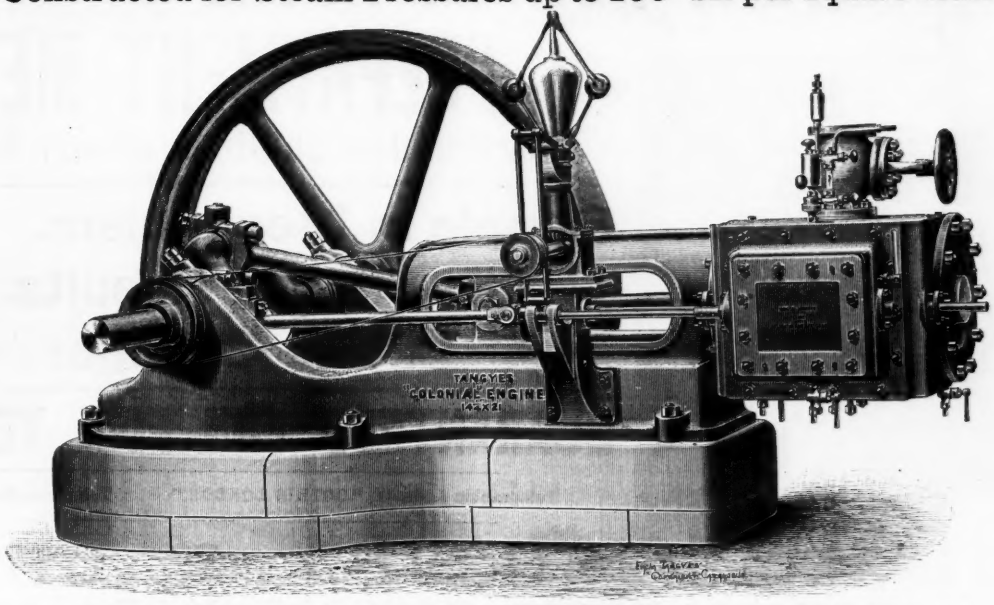
Telegrams { "GASHOLDER, STOCKTON-ON-TEES." "APPARATUS, LONDON."

TANGYES'
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



Tangyes' "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

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PREPAYMENT WET AND DRY GAS-METERS.

STATION GOVERNORS.

PRESSURE-REDUCERS.

ENGINES & EXHAUSTERS.

VALVES.

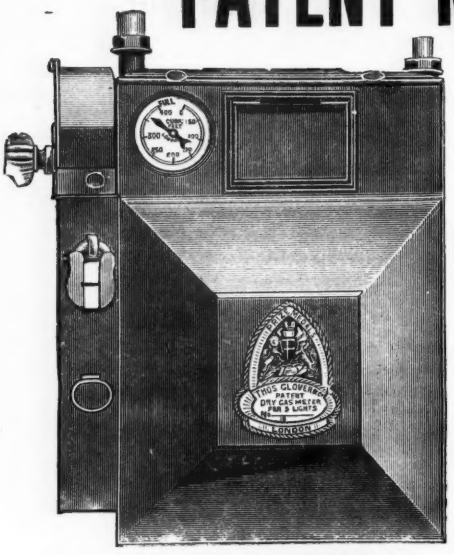
PRESSURE-GAUGES.

MAIN COCKS.

STATION METER—ITALIAN RENAISSANCE DESIGN.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

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DRY GAS-METER MANUFACTURERS,

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BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

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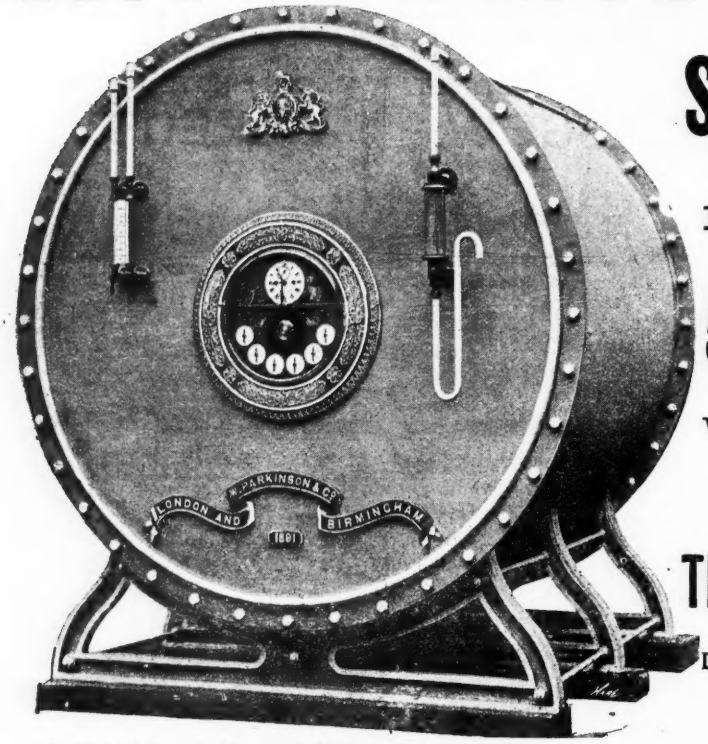

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EDITORIAL NOTES.

The General Election and Labour Politics.

THE General Election now in progress has advanced far enough to show what will be the character of the new House of Commons, and consequently what will be the general policy of the new Administration. It is not for us to say anything about questions of party politics; but it is impossible to pass over without recognition and some little comment the most salient feature of the polls that were held during the past week throughout the majority of the English boroughs, including London. This was the almost clean sweep made by the constituencies of the old representatives and new candidates who had identified themselves with Progressivism, Socialism, Trade Unionism, and all the other noisy and hare-brained sections of what was vainly imagined to be the "Popular" cause. Nobody could have known, until the test was applied, that the wishes and sentiments of British democracy were so completely misrepresented by the mushroom crop of politicians who during the last few years have styled themselves the leaders of the "People." The dominant party in the London County Council had a warning of their growing unpopularity in March; but what was then no more than a check and a withdrawal of their supposed "mandate" has now become a total rout. Progressivism throughout the country has had a reverse that may possibly chasten its mouthpieces in the Senate, the Municipal Council Chamber, and the Press; while the friends of real progress may justly take heart at the assurance they have received that the people of this country are nowise inclined to quit the ordered path of "Freedom "slowly broadening down from precedent to precedent," and embark upon a career of reckless experimental legislation inspired by the spirit of foreign-made Socialism. The men who organized the attack upon the London Water Companies, and would have gone on to sap the strength of the Gas Companies, are gone. Those who took the interested clamour of professional Trade Union chiefs—and the rawest of the order at that—for the truth of working-class sentiment, have been dismissed from the political eminences which they had gained or aspired to occupy by sheer force of audacity. Bearing in mind the actual preponderance in British borough constituencies of the workman voter, the ridiculous show made at the polls by independent Labour candidates and others who fondly thought they represented his views and aspirations, is nothing short of a revelation.

Digressing from this theme for a moment to remark with a satisfaction that will be shared by our readers that the special interests of the gas industry will be well represented in the new Parliament, if occasion should arise, by such sterling friends as Sir Julian Goldsmid, Mr. W. Woodall, Mr. John Aird, Mr. D. F. Goddard, and others, what is the correct inference to be drawn, not only as regards the prospects of the gas industry itself, but of every industry in which Englishmen earn their bread, from the discredit and defeat that has so opportunely overwhelmed the short-sighted instigators to industrial revolution and economic disaster? Simply, as Mr. George Livesey points out in the timely letter which appears in another part of the JOURNAL, that the natural and proper leaders of the forces of industry should take advantage of the inauguration of a period of comparative political and industrial peace, to make Capital and Labour friends for good and all, so that the discomfited agitator's place may know him no more when he recovers from his discomfiture. Surely, there is no fundamental difference between Mr. Livesey, Mr. W. Carr, Mr. M'Crae, and Mr. Stelfox—who, by the way, further explains his views to-day—and the other "good men and true" who have from time to time discussed the Labour Question in our columns, as to the righteousness of the policy of "live and let live," and the necessity for expanding the data of industrial economics to suit all worthy modern industrial developments.

The Report of the Standards of Light Committee.

THE issue of the report of the Standards of Light Committee as a parliamentary paper places this important contribution to the available store of information upon the subject at the command of every member of the gas engineering profession. The text of the report was made public in the form of an appendix to the communication

of the Secretary to the Committee—Professor Vivian B. Lewes—to the last meeting of the Incorporated Institution of Gas Engineers, and was noticed in these columns at the time. The parliamentary paper gives this text, supplemented by some valuable statements, and reports of the evidence taken by the Committee. The first witness invited to assist the Committee in their deliberations was Mr. G. T. Miller, whose evidence was required as to the changes that have taken place in the manufacture of sperm candles since 1876. A good deal had been said on different occasions upon this point, in support of the incontrovertible thesis that there are "candles and "candles." Some averred that candles are better light-givers now than they used to be; others that the reverse was the case. Mr. Miller's first words on the matter were that while the aims of the chandler had remained unchanged, his methods and appliances had been altered. The information given by the witness respecting the manufacture of sperm candles forms interesting reading, apart from its technical value, which is, of course, great. Then Mr. Vernon Harcourt gave the Committee some information on the subject of the manufacture of candle wicks. Mr. Vernon Harcourt's one-candle pentane standard came before the Committee at an early stage of the inquiry; and all the evidence obtainable at the time of the appointment of the Committee, as to the relative value of this standard and the light emitted by an average standard candle, is now given in summarized form. The one-candle unit led up to the ten-candle standard proposed by Mr. Dibdin; and this, as is known, commended itself to the Committee as the best available working photometric standard. The last portion of the paper consists of a report of the evidence and recommendations offered to the Committee by a deputation from the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute. These proceedings were of considerable interest, and were characterized by the strong effort made by Mr. Hunt to secure acceptance of his views as to the best method of testing gas. Something as nearly like a controversy as the circumstances permitted took place over this question, and also in regard to one or two other suggestions made by different members of the deputation. The alteration of the method of testing gas actually recommended by the Committee in the thirteenth and final paragraph of their report is a compromise. Every gas manager and photometrist should hasten to procure a copy of the paper, and ponder its contents. Legislation will be necessary to carry the recommendations of the Committee into effect; and there is yet time to discuss them further, if this is deemed desirable in the interests of the gas industry or of the public.

M. de Lachomette's Address to the French Gas Managers.

In another part of the present issue of the JOURNAL will be found an abstract report of the proceedings at the recent congress of the Société Technique du Gaz en France, translated from the account published by the official organ of the Society. M. de Lachomette presided, and delivered an address to which reference has already been made in these columns. In addition to that brief comment, we desire now to draw our readers' attention again to the sterling quality of M. de Lachomette's technical observations on the changes that occur in gas coal during storage, as well as of those upon other points of interest to the gas engineer. Intense practicality is throughout the note of the address, which from end to end does not contain a morsel of "padding." M. de Lachomette treats of the formation of naphthalene, among other matters; and he gives his adhesion to the hypothesis that this troublesome substance is formed exclusively during the process of carbonization, and is never formed afterwards. This opinion is probably just; but unfortunately the address does not contain convincing information as to the best way of arresting the naphthalene in parts of the plant where it can do no mischief. It is interesting to note that M. de Lachomette favours the use of a thermo-syphon as a means of keeping gasholder tanks free from ice during severe weather. This device has the recommendation of not requiring steam, which may be a consideration for small works; but, on the other hand, it cannot deal otherwise than indirectly with the water in the gasholder cups. The subject of distribution, of which the question of unaccounted-for gas is a branch, is treated of by M. de Lachomette in a manner that indicates the "solidarity" of the French and British technical position in this regard. A new departure in gas-works adminstration signalized in the address is the appointment of a lady as inspector of gas-stoves at Bayonne. It is declared—and the statement may well be believed—that this experiment has been attended with satisfactory results. The address refers to the old difficulty of the freezing of consumers' wet meters; discussing several suggested remedies for the evil, among which, however, the adoption of dry meters is not to be found. Will anybody say why it is that there is no market for the dry meter in France?

M. de Lachomette's concluding remarks are instinct with homely, solid wisdom. "Act always in accordance "with the teaching of experience," he says; "but do not "pay too dearly for it. Learn from the experiences of "others; and do not forget to study." So we may paraphrase his counsel; but there is one little bit of advice which deserves to be repeated here verbatim: "Notwith-"standing all our knowledge, there are some very simple "facts which lie close to us in our path, yet of which we are "ignorant, simply because we have not learnt to see them." It is the old, yet ever new and necessary lesson of the value of the "seeing eye," which needs to be constantly borne in mind in this age of much instruction and imperfect education. The wise man in every calling is not he who has been taught, but he who has perceived. The careless, indolent man kicks a pebble out of his path a hundred times; and then another man comes along and sees it is a diamond. Last of all, the man of the schools examines the discovery, and certifies its value. Such is the way of the industrial world.

The Affairs of the European Gas Company.

The report of the Directors and the speech of the Chairman of the European Gas Company, Limited, presented and delivered at the annual general meeting of proprietors on the 15th inst., and reported elsewhere, give a clear view of the condition of the gas industry in those Continental regions where the Company do business, There has been some slight falling off in the aggregate revenue derived from the seven stations of the undertaking, due partly to climatic influences, and partly to the competition of electric lighting. Curiously enough, during part of the winter the weather was too mild to suit the Company; and for the remainder of the season it was too severe. At first it was impossible to get rid of coke except at a reduction in price; and then the frost became so intense that, though coke sold at prices which made the managers regret they had tried to reduce stocks, gas became a drug, owing to the dulness of trade. People could not get about while the Arctic weather lasted; and so the shops shut early, and everybody went to bed betimes, to the loss of the Gas Company. The Directors make no effort to conceal the damage that electric lighting has done their business in some centres. The incandescent gas-burner notwithstanding, some factories and large *cafés* will have electric light; and it takes a good many small consumers—whose number is, however, increasing—to make up for a big defection of the former order of consumers. The Chairman (Mr. J. Blacket Gill) told the shareholders at the meeting that, in going his round of the stations, he was struck by the great inroads electricity had made among the consumers. "The *cafés* were their most important "customers"—and the *café* frequenters would have electric lighting, at whatever cost to the proprietor.

It is satisfactory to observe that Mr. Gill did not allow this statement to escape him without attaching to it an explanation which goes to the very root of the difference between the circumstances of a Continental Gas Company and one at home. The fact is that on the Continent the position of gas lighting in the popular economy has not been very different, if at all, from that now being sought by electricity. It has been regarded as a luxury; and the idea of charging a popular price for it has been rendered impracticable in many places by the action of the local authorities in making the gas company pay heavily for the privilege of existence. Indirect is preferred to direct taxation on the Continent; and gas has seemed to the national and municipal authorities an ideal subject for taxation to the last extremity, because the consumers were, almost without exception, well-to-do householders, and the companies, as a rule, flourishing. It is notorious how in Paris itself the Municipality force the Gas Company to charge an exorbitant price for gas, in order that their

share of the excessive profits may be large; while at the same time the local politicians curry favour with the populace by denouncing their partners in extortion. So in such places as Havre and Nantes it is still the large *cafés* and principal shops and factories that support the Gas Company; for, after all these years, gas is still a luxury in the estimation of the poor and thrifty private resident. These large consumers are the first to throw a company over if they can gain the merest trifle by so doing; and yet they are the most exacting of customers while they remain on the company's books. In England, the *café* does not bulk so largely in the estimation of the gas manager as is the case in France; but the factory is everywhere almost as great a source of trouble as its custom is worth. No doubt a good general connection is vastly preferable to a few large public-house and factory accounts.

The Railway Congress—A Bright Example.

THE Railway Congress that has just been held in London, and also spread itself pretty extensively over all parts of the United Kingdom, appears to have been a great success. It presented several features of interest to those who are familiar with gatherings of a similar character, from which some lessons are to be drawn for use later on. The most striking of these peculiarities of the Congress was the frank way in which it was conceded that the main object of the gathering was the bringing together of a number of men of the same calling. The element of formality in this process was reduced to the minimum. Lists of papers were prepared, it is true, by sectional Committees; but none of these communications was intended to be read in public meeting. The members were supplied beforehand with prints of the papers; and the whole of the time of the sectional meetings was devoted to discussion only. There were no presidential addresses; but instead there were any number of excursions far and wide, including what may be called a grand parade before Her Majesty the Queen. And now all the visitors are bearing testimony to the thorough enjoyableness and instructive nature of the whole affair. This bears out what we have always observed in respect of gas managers' meetings. Technical papers, when they are good, are very useful; and success in obtaining an unfailing supply of these productions is a proof of the utility of a society, and of the devotion and popularity of the Secretary. But discussions are equally, or even more, desirable; and opportunities for the full and free converse of kindred souls are best of all. It is to be hoped that the bright example of the Railway Congress will be improved upon by some dry-as-dust technical societies we wot of, but refrain from naming, whose managers seem to regard dulness as a guarantee of respectability.

The Cheapness of Money.

THE enormous appreciation of first-class investments that has aroused so much attention of late wherever merchants and financiers "most do congregate," can only be fully explained by reference to a vast number of considerations and influences that have co-operated to produce this remarkable result. The steady advance in the value of gas stocks which we have had to record week after week must have struck everybody even remotely interested in the industry as a really wonderful sign of the times. Some have thought that the South Metropolitan Bill, by giving greater publicity to the financial strength of the largest gas undertakings, helped to attract purchasers to the limited gas stock market; and this may partially account for the high price of this order of investments. But no accident of this kind would have availed to force up the value of gas property if there had not been a plethora of money for which it was impossible to find safe and profitable employment. Some noteworthy observations on this head were recently made by the Chairman of a large Discount Company, on the occasion of the half-yearly general meeting of proprietors. It was then stated that the Company had again gone through the whole of the half year with what had been called the dreary monotony of a 2 per cent. Bank of England rate. This low rate, however, was not the worst so far as the Company's business was concerned; for they had to discount the large portion of the bills which they took in at the market rate, which, for three months' banking bills, had been 17s. per cent. per annum only. "For discounting a "bill for £100 having three months to run, they received, "therefore, the small sum of 4s. 3d., out of which they had "to pay salaries, rent, and something for the money to "discount it with." After this it seems ridiculous for would-be reformers of the Henry George pattern to prate about the burden on industry of the financial middleman. Still, it seems that the Board of the particular Discount Company now in question were able to pay a dividend after the rate of 9 per cent. per annum on their capital of £650,000. So that lending money at the rate of 17s. per cent. per annum cannot be such bad business after all. It would require a good deal of mastery of the mysteries of modern finance to fill up the gap between these two rates of interest on capital, making due allowance for all working expenses besides.

WATER AND SANITARY AFFAIRS.

THERE is now, or has lately been, prevailing in the district of the East London Company, a "water famine" at the rate of 30 gallons daily per head of the population. Even an allowance of 30 gallons per head is better than nothing, though it has to include all purposes. If some people were to have their way, the supply would soon be reduced to vanishing-point, unless the rains of heaven came to the rescue. To let the supply run through open taps and the garden-hose, during every hour of the day and night, while an unprecedented drought takes effect on the source that has to be drawn upon, is a sure way of rendering the stock bankrupt. With the volume of water daily shrinking in the reservoirs, the guardians of the supply were bound to be careful. Hence it came to pass that on the 12th inst. the East London Company found it necessary to issue a notice stating that, owing to "the unprecedented "and continuous drought," the hours of service would have to be curtailed; and the people were advised to store a supply while the water was on. "And yet," said the *Daily Chronicle*, "the Royal Commission on the water supply "assured us that the water supplied by the present Com-"panies was sufficient for all our needs." So also our contemporary might remember that an eminent Progressive in the County Council argued in the House of Commons that the East London Water Bill might be safely shelved, for the Company had distinctly declared that there was "plenty of water." The Bill was thrown over for a year, thanks to Mr. Burns and the Irish vote; and we see the result. There is plenty of water, as in Jacob's well; but there must needs be something to draw with. Pumps are wanted, and pipes, and reservoirs—things which all cost money. But the County Council had resolved that no further capital should be raised by any of the London Water Companies, pending the transfer of the undertakings to the "one representative public body." Rather less than a fortnight ago, the inspired *London* commended to public approval those members of the County Council—including some few candidates for parliamentary honours—who had voted in March, 1893, against the Bill by which the East London Company sought power to increase their capital and extend their works. On that occasion, Mr. Mellor, the Chairman of Committees, warned the House that the "very gravest responsibility would be incurred" if they refused to send the Bill to a Committee. Yet the Bill was rejected; and when it was brought forward again last year, it was carried on the second reading by a bare majority of one. Had the Bill been lost in 1894 as it was in 1893, the prospect now would be eminently serious. Getting their Bill through Parliament in August last, the Directors lost no time in commencing the requisite works. Of the real need, there can now be no doubt. The very day following that on which *London* held up for approval the conduct of those members of the late Parliament who opposed the Bill, the East London Company issued the notice warning the public that care must be taken to economize the supply.

It is now shown, by a statement issued by the Company's Secretary (Mr. I. A. Crookenden), and by a letter which Mr. Bryan, their Chief Engineer, has addressed to the *Standard*, that if the Company's Bill had been passed in 1893 instead of 1894, the storage capacity of the works would have been enlarged ere this by 200 million gallons, and there would have been an additional supply of 3 million gallons a day. All complaint of a restricted supply would thus have been prevented, and East London might have

gone on perpetuating the waste which undoubtedly exists in that quarter. The constant supply in that district is subject to an abuse which unduly taxes the sources whence the water is drawn. A far too extensive abandonment of cisterns obviously places the supply beyond that control which prudence would dictate. But the great consideration to be kept in view is the fact that in this case Parliament was induced to prevent the Company from making that provision which was absolutely needful for the safety and comfort of the public. *London* says "it was not con- "sidered desirable that the Companies should have power "to incur more capital expenditure, as this meant that "the ratepayers would have all the more compensation "to pay for the undertakings." But it also meant that the public would have to suffer for the want of that supply which the Companies were anxious to give. Futile attempts have been made to penalize the East London Company by proceedings in the Police Courts. No such proceedings would enable the Directors to supply an additional gallon of water, nor would avail against the fact that works cannot be constructed if Parliament refuses the money to pay for them. Let us consider what would have been the result if the Company's Bill had been rejected on the second occasion. If the loss of a year proves thus perilous, what would have been the consequence had two years been lost? Beyond all this, the County Council would have stopped extension altogether, reckless of the mischief thus rendered inevitable. It cannot be said that the result of the recent elections in the Metropolitan boroughs has shown the gratitude of the electors for the policy of the Progressives. The *Daily Chronicle* is itself amazed at the result, and wonders what has happened to the London working man. The candidates held up for approval by the Progressive organ have fared badly; and those whom it has reprobated have largely succeeded. The failure of Mr. Benn to obtain re-election in St. George's-in-the-East, and the rejection of Mr. Costelloe in East St. Pancras, are incidents which show that the policy of "harrying" the Water Companies, as the *Standard* terms it, is not sufficiently popular to secure a seat in Parliament. The fate of Mr. Cornwall in Fulham, Mr. Steadman in Hammersmith, and Mr. Beaufoy in Kennington, points to the same conclusion. Amid all the political changes which now surround us, we are promised by the County Council organ that the Transfer Bills "will be undoubtedly revived "in the new Parliament," and will "have a chance of "becoming law," for the sublime reason that "they are "supported by a majority of the Council, including a num- "ber of Moderates." It is thus very hard to forego the notion that Parliament, as far as regards London questions, is to take its cue from Spring Gardens. Where is Mr. Shaw Lefevre?

Every organ in the press, however rabid in its politics or special in its methods of pleading, should make some semblance of a judicial attitude. But when a newspaper elects to deal with questions affecting a water company, even the show of impartiality is put aside, and its sense of justice straightway assumes the character of Euclid's point, which had no parts and no magnitude. The six-penny papers, when hard up for something or somebody to attack, turn with avidity to the water question of the moment. The penny papers do likewise; and, needless to say, the halfpenny journals follow suit. Even so, and in like manner, the *Echo* has just delivered itself in regard to the present difficulties of supply in the district of the East London Water Company. People might well infer, from the remarks of our contemporary, that water companies are never so happy as when the consumer suffers; that there is a special joy among Directors when seasons of frost or of drought set in; and that the highest payment for the smallest quantity of water is the one object which all the water companies keep steadily in view. The *Echo*, therefore, manufactures a grievance out of the prudent notice recently issued by the East London Company to their consumers—that, in consequence of the drought, the water supply must be limited for a certain number of hours per day. "The East-enders quietly submitted." Probably the East-enders are more sensible than their self-appointed champion. They could scarcely be so poorly endowed as the *Echo* is with the spirit of fair play or common sense. Not content with merely taking up the drought question, our contemporary harks back to the topic of the great frost; declaring that "the same fate is "befalling these poor consumers in the depth of summer "as in the depth of winter." Then comes an altogether inconsequent attack on the class-legislators who are supposed to have taken care that, whosoever suffers from "the "act of God," it shall not be the Company's shareholders. Upon one point, however, the *Echo* is perfectly right. Probably the Directors and officers of the Water Companies are quite as sympathizing as the Press with the position of the East-enders on the question referred to by our contemporary—viz., the absence of cisterns; and here we also may cordially join in their expressions of regret. But to whom is the absence of cisterns to be attributed? Assuredly not to the Water Companies; and yet, if a system of storage were universal, there would be no occasion for the *Echo's* outcry, and no necessity for the inconvenience which some of the East London Company's customers are now experiencing. But to blame the Companies for husbanding their resources, and putting their customers on guard against further trouble if the drought continues, is simply an absurd reversal of the attitude which an impartial journal should assume in regard to such a subject. We do not say that the *Echo's* latest contribution to the water question is more worthless than many articles that have previously been published on the subject; but, on the other hand, it certainly cannot honestly be asserted as in any respect more intelligent or valuable.

At a season of the year when extravagance in the use of water is especially reprehensible, people should hardly complain if suppliers of this valuable element seek to check its unauthorized consumption. For our part, we can discover no hardship in the case reported in the JOURNAL last week, of the gentleman at Bristol, who, though he paid only for a supply for domestic purposes, was twice seen watering his garden with a hose, and performing the same "generous" office for his next-door neighbour. The Company proceeded against this gentleman in accordance with law, and, it may be added, in pursuance of those principles of fairness towards consumers in general by which suppliers of water should always be influenced. But the defendant—Mr. Hawkes—found himself before an indulgent tribunal. Judge Austin thought there was no reason why Mr. Hawkes should not have been warned. But, on the other hand, it is difficult to see why he should have been. He offended not once but twice, possibly oftener; and pouring water that did not belong to him into somebody else's garden as well as his own, is scarcely to be regarded as a mitigating circumstance. This sort of generosity at other people's expense is not to be commended. Moreover, in the case referred to, there was strong evidence of deliberation in the acts complained of. Why was Mr. Hawkes in possession of a garden-hose unless he meant to use it in his garden? Judge Austin thought it was possible that the defendant was ignorant of the fact that he was committing an offence. Possible, of course, but scarcely probable; and, at all events, Mr. Hawkes made no attempt to prove his ignorance, or even to allege it by the mouth of his advocate. On the whole —and it is very singular—Judge Austin seemed to regard the Bristol Water Company as a greater offender than the defendant. The learned gentleman thought it was "rather "sharp practice to let the defendant go on in his offence, "and then 'pull him up' for his second offence." But, surely, if there were sharp practice at all, it was on the part of Mr. Hawkes. As to warning him or anybody else, we take leave to say that the idea is absurd. The Act of Parliament does not require an offender to be warned. He is presumed to know what he is about, and probably does know. To hold that a man must first be warned and then proceeded against is to suggest an impracticable course of procedure. Water companies cannot detail a special staff of detectives to perform this sort of work. If a consumer is not prosecuted for his first offence, he should think himself lucky, instead of complaining that he was thereby induced to offend again. Many a consumer who has a garden-hose leaves it upon his lawn with the water running to waste. No one can tell the extent to which this sort of water peculation goes on; and when a case is discovered, it certainly behoves a company to prosecute, not merely by way of discipline for the offender, but also as a warning—the most effectual sort of warning—to others. Constrained by the Act of Parliament, Judge Austin imposed a penalty (a very small one); but it would be a pity if people were encouraged by his *obiter dicta* to adopt a system that is at once selfish and illegal.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 197.)

THE course of things on the Stock Exchange was rather a surprise. That business should be quiet, one was prepared for; the excitement of the elections having exercised considerable distraction, apart from other influences which drew attention elsewhere. But the markets suffered to a great extent. Beginning slack, they grew irregular and finished really flat. Prices in all the chief departments ran down, from Consols to the end of the list; the Foreign Market especially being a heavy loser. For this, the Bulgarian spark near the powder-barrel of the Eastern Question is mainly responsible. The Money Market continues in the same depressed condition. But, while prices were falling in the large departments, the strength and buoyancy of Gas stocks were actually increased; and prices seemed to rise for each parcel of stock as it came in. Gaslight "A" did not show any disposition to move at first, and jogged along, at prices varying little above or below 284, until the dividend announcement was made, and then it jumped up to 289½. The dividend for the half year is to be at the rate of 12¾ per cent., as against the previous 12 per cent.; and the balance carried forward will be greater by about £1550. As the increased dividend will require about £42,350, an improvement of about £44,000 in the revenue balance is apparent. Little was done in Gaslight secured issues; but the few bargains marked were at good figures. South Metropolitans were hardly touched, and made no sign. In Commercials, the old stock got a chance of moving, and was done on Thursday at 304—a noteworthy incident, as it had never previously topped the third century. Very little business was done among the Suburbans and Provincials; and although excellent bids were made for many of them, yet holders were apparently quite content to keep their stocks. Large advances were scored in the Continental group. Union sprang up to 265, and stands quoted with a ten-point margin. Cagliari also made a very large bound upwards; while Imperial and European effected substantial advances. Malta improved fractionally; and Bombay and San Paulo, in the remoter world, did the like. A good bit of business was done in the Water Companies, especially their debenture stocks; and some of the ordinary stocks had a good rise. New River was put up, 10 to 385-95; but as buyers in the Mart on Wednesday were willing to give 405, the quotation is not at all excessive. East London fell 2, owing to troubles with their supply.

The daily operations were: Gas opened unchanged on Monday; but prices showed a tendency to rise, though an advance of ½ in San Paulo was the only move. In Water, Lambeth old rose 1½; and ditto new, 1. Business in Gas remained very limited all through Tuesday. Imperial Continental advanced 2; and Cagliari, 1. In Water, Southwark "D" rose 5. Transactions in Gas on Wednesday were on about the same scale. Cagliari gained another 1½. Business was considerably brisker on Thursday; and prices were excellent. Commercial old improved 7; Continental Union, 2½; and Malta, ¼. New River rose 5. Activity in Gas was maintained on Friday; and Continental Union gained another 5. East London Water fell 2. Saturday was quiet, but important. Both Brentfords advanced 5; Gaslight "A," 3; British and European, ½ each; and Bombay, ¼. New River also rose 5.

ELECTRIC LIGHTING MEMORANDA.

Curious Accident to Electrical Power Plant—What it Takes to Work an Electrical Tramway—Proposed Electric Lighting of the Thames Embankment.

A CURIOUS accident to the electrical power plant of a Toronto street railway company was recently reported in a Canadian paper. It appears that a man left in charge of a new Siemens-Halske dynamo which had not been taken over from the contractors amused himself, in the absence of the Electrician-in-Chief, by scraping the machine with a knife. The consequence was that before the implement in question could be named by the startled attendant, it was drawn in, and the armature short-circuited. The machine then "went;" and the man was badly burnt. The accident threw so great a strain on another generator, that it immediately broke down; and the street traffic was suspended until matters inside the power-house could be set right. And all because somebody's sense of neatness instigated him to scrape off some kind of dirt from a dynamo with the handiest tool at his command. There is a familiar American saying which warns people against "monkeying with a band saw;" but the danger of meddling in an unauthorized way with the dynamo, even in the interest of cleanliness, is all the greater for being unsuspected until the damage is done. Seeing how small a margin for safe working is permitted by the construction of electrical power machinery, the marvel is not that breakdowns occasionally occur, but rather that dynamos and their armatures do not go wrong more frequently than is actually the case.

There seems to be a deplorable waste of power in electrical tramway systems, which requires stopping before this means of working can claim to be regarded as economical, in the scientific sense of the term. What is described as an excellent example of the Thomson-Houston single-trolley system has been laid down in Brussels, to the order of the Municipality; and, after a year's contractors' trial, it is to be taken over by the authorities this month. It is to be hoped they will be satisfied with their bargain. There are about 5¾ miles of line running through a thickly-populated district, of which the well-known Nord Railway Station constitutes one terminus. The wires are carried overhead, on standards placed at the edge of the pavement; the arrangement being described as "not unsightly." Of course, everything connected with the line is first class; and everybody concerned with its construction and working, including the public, is reported to be pleased with the whole outfit. But here comes the singular feature of the undertaking. To work this 5¾ miles of double tramway with 22 cars, each designed to carry 35 passengers—the heaviest incline being a slope of 6·8 per cent.—there are provided five 180-horse power engines, with as many dynamos. The cars, full and empty, weigh 6½ tons and 2½ tons respectively. What an enermous surplusage of electrical power, as compared with horseflesh, marks this installation! A pair of Flemish horses could easily run away with one of these loaded cars; and though the speed at which they are stated to be driven by electricity is perhaps double that of an ordinary horse tramcar, there must be something very crude about a system which needs 900 indicated horse power to keep 22 tramcars moving.

An instructive example of the difficulties attending the introduction of electric lighting into places where it is not required except for the "fancy," is supplied by the proposals of the Highways Committee of the London County Council for electrically lighting the Victoria Embankment and Gardens and Waterloo and Westminster Bridges. This matter has been before the Council for years; and it has hitherto been found impossible to make any progress towards the realization of the general idea, which has received the approval of the Council and been provided for by one of their Money Acts. In 1893, a scheme was propounded which would have cost a capital sum of £20,000, and involved an estimate annual expenditure of nearly £4000. As this was a greater outlay than the Council thought it desirable to incur for such an object; and as, moreover, it was doubtful whether the new system of lighting the Embankment could have been carried out without spoiling the finest thoroughfare and "pleasure quay" in Europe, the Council deferred consideration of the project until the spring of this year. Then the Highways Committee went at it again; and, with a view to reducing the expenses, they decided in their new scheme to leave out the lighting of the Embankment Gardens. Moreover, they decided only to do the job by halves—putting the electric lamp standards along the kerb line on each side of the roadway, and leaving the parapet lamps to be lighted "when required" by gas as at present. This would bring down the estimated first cost to £16,590, with an estimated annual charge of £2768. The scheme is, however, open to the fatal objection that it does not provide for the electric lighting of the Embankment, but only for placing a few electric arc lamps in juxtaposition with the gas-lamps, to the detriment of the useful and ornamental effect of both. The Committee offer the interesting statement that, in the event of their scheme being sanctioned, they propose "to ask the Technical Education Board to allow its inspectors of art schools and classes to assist them in preparing designs for the lamp standards; and they hope to be able to obtain a design for a standard lamp which would be worthy of being placed in that, the first thoroughfare in London." There will be no harm in starting the competition, even if the lamp-columns are never destined to be placed on the Embankment. It would be very interesting indeed to see what would be the outcome of such a competition.

THE REPORT OF THE BOARD OF TRADE COMMITTEE ON PHOTOMETRIC STANDARDS.

IN the JOURNAL for May 14 last, we noticed the presentation to Parliament of the Report of the Committee appointed by the Board of Trade "to inquire into, and report to them upon, the subject of the standards to be used for testing the illuminating power of coal gas." The report, with the appendix, was issued last Thursday as a parliamentary paper. The text of the report was given in the number of the JOURNAL above mentioned, as well as the section of the appendix devoted to a description of Mr. Dibdin's ten-candle pentane air-gas standard, which, it will be remembered, was recommended by the Committee for adoption. We now briefly notice the rest of the matter contained in the appendix.

Section I. sets forth the circumstances under which the Committee was appointed on Dec. 23, 1891. It was constituted as follows: Mr. W. J. Dibdin, F.I.C., F.C.S.; Dr. E. Frankland, F.R.S.; Mr. Henry E. Jones, M.Inst.C.E.; Mr. George Livesey, M.Inst.C.E.; Dr. W. Odling, F.R.S.; Mr. G. Rose-Innes; Dr. W. J. Russell, F.R.S.; Mr. G. C. Trewby, M.Inst.C.E.; and the Metropolitan Gas Referees (Mr. A. G. Vernon Harcourt, F.R.S.; Dr. W. Pole, F.R.S.; and Professor A. W. Rücker, F.R.S.). Dr. Odling was selected to preside over the deliberations of the Committee; and Professor Vivian B. Lewes, F.I.C., F.C.S., was appointed Secretary. Section II. treats of the use of sperm candles

as a standard of light; the conclusion arrived at by the Committee being that they are not to be depended upon, and therefore should give place to "some more uniform and reliable unit." When considering this subject, the Committee had before them Mr. G. T. Miller to give evidence as to the changes which have taken place in the manufacture of sperm candles since 1876. A verbatim report of this evidence is given as an *addendum* to the section under notice. Sperm candles having been condemned, the Committee proceeded to look for a substitute. Section III. is therefore devoted to an illustrated description of Mr. Vernon Harcourt's one-candle pentane air-gas unit; appended thereto being a summary of observations on the amount of light given by the pentane flame at different heights. Section IV. contains an epitome of the evidence obtainable, at the time of the appointment of the Committee, as to the relative value of the one-candle pentane air-gas flame and the light emitted by an average standard candle; and we learn therefrom that the value of the former is 1·021 sperm candles when burning at a height of 63·5 millimetres. The Committee next considered the effect, on the amount of light emitted, of setting the height of the one-candle pentane flame with and without a screen; and the results of their investigations are to be found in Section V. Four series of observations were made—the first with a 100-inch improved Evans-Sugg photometer; the other three, with a Letheby open-bar photometer. A ten-candle pentane Argand was arranged at one end of the bar as a constant source of light; while the one-candle unit, set alternately with and without the aid of a screen, was used to test its illuminating value. The first series of observations (66 in number) showed a mean difference of 2·7 per cent.; the second (102 observations), 2·4 per cent.; the third (108 observations), 3·1 per cent.; and the fourth (216 observations), 2·4 per cent.—or, for the 492 observations, a mean difference of 2·59 per cent. The Committee had reason to believe that in previous experiments the height of the pentane flame was fixed when the eye of the observer was not screened. According to the results given in Section V., therefore, the value of the pentane one-candle flame, expressed in terms of standard candles, would be 2·6 per cent. too high. The tabulated results in Section IV. are therefore corrected in Section VI.; and the value of 1·007 instead of 1·021 candles is given to the flame, or, omitting one abnormally high result, 1·001 candles. Section VII. is devoted to the Dibdin ten-candle pentane Argand; a large number of results being given of tests made with the flame at various heights, and with different chimneys. In the following section (VIII.), the Committee consider the possibilty of simplifying this burner, and determining the height at which the flame should be screened off in order to emit a constant light of ten candles. Section IX. contains a description of the Dibdin ten-candle standard as recommended by the Committee. This section, as already mentioned, has been given in its entirety in the JOURNAL. Section X. is on the effect of the humidity of the atmosphere upon the amount of light emitted by luminous flames. In Section XI., some interesting particulars are to be found in regard to pentane; and Section XII. consists of a report of the interview which took place between the Committee and representatives of the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute on the general question of gas-testing. This section is reproduced in another column to-day.

Death of Herr Schiele.—We regret to record the death, after a few days' illness, from lung disease, of Herr Simon Schiele, of Frankfort-on-the-Main. Deceased was one of the founders of the Association of German Gas and Water Engineers, and was for some years the President. He was a very able man; and his memory will be highly cherished by his colleagues.

Deaths of Two German Gas Engineers.—The death is announced of Herr Carl Heinrich Ballauf, Manager of the Dortmund Gas Company—an appointment he had held since 1884. He was a very active member of the Association of Rhenish and Westphalian Gas and Water Engineers. Herr Louis Hartmann, who from 1860 to 1885 was Manager of the Zurich Gas-Works, has lately died after a protracted illness. He was one of the founders, and an honorary member, of the Swiss Association of Gas and Water Engineers.

Mr. Marshall's Gas Institution Paper on the Monier System.—It is due to readers of the JOURNAL who were interested in Mr. Marshall's paper, read before the Incorporated Institution of Gas Engineers, on the Monier system of building construction, that they should be warned against taking the formulæ of Mr. Marshall's Appendix (see JOURNAL for June 11, p. 1247 *et seq.*) as correctly expressed for English readers. This appendix was printed from a copy specially supplied to us by Mr. Marshall; but he now desires to correct it in various particulars, which is, of course, impossible without reprinting it in full. The formulæ contain in several places the sign ÷, which, if read in the usual English way as a sign of division, deprives the expressions of meaning. This sign as employed by Mr. Marshall, we are now informed, is to be read as another way of writing the minus sign —. This is a most regrettable confusion, for which we are not responsible. Mr. Marshall states, in response to an inquiry, that all information respecting the Monier system is to be obtained from the Actien Gesell. für Monier Bauten, Leipzigerstrasse, 101 and 102, Berlin.

DIPS INTO THE PAST.—PROJECTS THAT FAILED.

(*Concluded from p.* 136.)

IN discoursing on "projects that failed," the difficulty is not to find examples wherewith to point the moral, but to make suitable selection among the numerous instances that have occurred during the growth of the gas industry. Many have been the processes designed—like White's—to revolutionize the method of producing coal gas, which have met, in the long run, with no better success. Such an one was Dr. Eveleigh's, which, on its introduction some twenty-five years ago, was commonly supposed "would produce something like a revolution in gas affairs." This "improved" method of gas making went to the root of the matter in endeavouring to convict the ordinary method of being founded upon a wrong principle. Thus, instead of aiming at converting the coal immediately into gas, by the employment of a sufficiently high temperature, the process was divided into two operations. The coal was carbonized at a low heat, and the resulting tar subsequently vaporized, and the vapours conducted through highly-heated retorts, in order that they might be converted into gas. The process was fairly tried, for three years, on a working scale; but, notwithstanding the modification of many of its details, as experience suggested, it was found impossible to make it a practical success—chiefly owing to persistent stoppages of the pipes and apparatus by thickened tar and pitch, and the irregularity of the product obtained—and the process was eventually discarded.

Proceeding from the production of gas to its subsequent treatment and purification, we find that, as invention has here been most active, the endeavours after improvement are studded with examples of error which deserved to fail, as well as with instances of commendable ingenuity, perseveringly applied, that met with but partial success. Take the apparently simple operation of eliminating from the foul gas the ammonia it contains. It would seem that nothing could more efficiently and economically serve this purpose than washing or scrubbing with water, as is now almost universally practised. Yet it has taken a long course of invention and improvement in matters of detail to bring this operation to its present perfection, so as to recover the ammonia without having to employ an excessive quantity of water; and numerous have been the endeavours to supersede water by some other material. The only argument that could be urged to justify the change was that, by washing with water, some of the illuminating constituents were abstracted from the gas. With regard to this matter, there has been considerable difference of opinion. On the one hand, it was contended that "water cannot be used to dissolve the impurities of gas without, at the same time, dissolving its most valuable illuminating constituents; and whenever it is used in sufficient quantity to remove what is hurtful, it reduces the illuminating value very much." On the other hand, water was said to have "little or no influence on any of the hydrocarbons except acetylene; and as this exists in gas only to a very small extent, there is little or no danger from a copious washing of the gas before it goes to the purifiers." If we examine the facts which the opponents of water washing advanced to support their contention, we may appreciate (if we cannot reconcile) the different views taken by the two parties. Wrote one of the former: "Valuable illuminants are produced and then washed away and rendered useless. Any engineer may satisfy himself of this by determining the illuminating power of his gas, and then passing a few feet of it slowly through a large cask of water into a test gasholder." Now the conditions of the experiment thus proposed, for demonstrating the evil effects of water washing, are not the same as obtained in an intelligently designed and well-regulated apparatus for washing or scrubbing gas. In fact, those who relied upon it and similar experiments merely showed that it is possible to deteriorate the quality of illuminating gas by rigorous treatment with sufficient cold water, and not that such deterioration invariably occurs in the ordinary process of washing or scrubbing gas.

In the early days of gas purification, when the removal of the ammonia, after being long neglected, was at last forced upon the attention of gas engineers, it was an obvious step to make use of acids for the purpose. While completely effective in arresting ammonia, however, it was soon perceived that the injurious effect of acids upon the illuminating constituents of the gas was a fatal objection to their continued employment. The use of various metallic and earthy salts, and other chemical substances, was then proposed, and in many cases patented. "Indeed, it would appear," it has been aptly said, "as if all the refuse matters of the arts had been successively tried and patented, in the hope of their becoming a means of extracting the impurities from coal gas."

One of the substances proposed for abstracting the ammonia without injuring the illuminating constituents of the gas, which attracted some attention, was common clay, introduced for this purpose by Bowditch, in 1854. It was said to be as effective in removing ammonia as acids or metallic salts, while exerting no deleterious effect on the other constituents of the gas. After being used for purifying gas, the clay could be sold as a manure. The removal of ammonia by water in the end prevailed, however, because it possessed the great advantage over all the other substances proposed, that it allowed of utilizing to the full the power of ammonia to combine with the acid impurities

(sulphuretted hydrogen and carbonic acid) in the gas. It thus, in effect, acted as an auxiliary to the ordinary purifying process. And, further, the solution of ammonia in water was found, in the long run, to be the most generally useful, and therefore the most valuable form in which it could be had. The importance of this latter consideration is brought out in connection with a more recent project for the removal of ammonia without the use of water.

So recently as the year 1881 some considerable stir in the gas world was caused by the introduction of a patented process for removing ammonia from foul gas by its absorption in commercial superphosphate of lime, placed on trays in the ordinary purifiers. The process was cared for by a strong Company, directed by several eminent engineers and scientific experts. It was tried on an extensive scale in one of the principal gas-works of the Metropolis, and subsequently in one of the most ably-directed gas-works on the Continent; and the reports of experts—including some of the highest authorities in the gas profession—were unanimous in asserting that the material was the most efficient agent ever introduced for absolutely removing every trace of ammonia from the gas. The process did not involve any deterioration whatever of the illuminating constituents of the gas. Moreover, the spent material formed a highly valuable manure. Thus everything seemed to indicate the inauguration of a new era in gas purification, when scrubbing or washing with water would become a thing of the past. Yet the process never came into general or any extensive use; but after achieving a little notoriety, it dropped out of sight, and was no more heard of. In fact, the process had its economical as well as its technical aspect to be considered. As was remarked in the JOURNAL on the introduction of the process, the question upon which its future wholly depended was as to whether the bye-product it recovered was more valuable in the form of ammoniated superphosphate than as common ammoniacal liquor. In the absence of information to the contrary, we must conclude that this was the rock on which the hopeful venture split.

Many examples of failure are found among the attempts of inventors to improve upon the mechanical appliances of gas manufacture. Some of these attempts exhibit considerable ingenuity which failed in effect through insufficient acquaintance with the real conditions under which the work aimed at has to be done. Others were too extravagant in conception ever to be transformed into actual working possibilities. To take examples only from the purifying department. Hills, who first proposed the admission of a little air with the gas, in the working of oxide purifiers, found that, under the treatment, the material caked into a hard mass on the grids, thereby throwing considerable back-pressure on the apparatus. This he endeavoured to remedy by inventing a mechanical arrangement of stirrers within the purifier, whereby the cake of oxide could be disintegrated or broken up, so as to offer less resistance to the gas. It was found, however, in practice, that the moving parts corroded and stuck fast; and therefore it was soon discarded as unworkable.

Another inventor, with greater boldness, designed a purifying apparatus, for use with oxide, in which, by ingenious mechanical arrangements, the material was to be kept in slow motion and gradual descent through the several tiers or floors of the purifier all the time the gas was being purified, until, by the time the oxide became spent, it reached the lowermost (a detached) chamber, wherein it was exposed to a current of air, and so revivified; the revivified material being subsequently raised again by an elevator to the upper tier of the purifier, when the process began *de novo*. Another as bold a scheme was proposed for dealing with sulphided lime purifiers, when the removal of the spent material, in the ordinary way, gave rise to offensive effluvia. It was proposed to make the purifiers themselves portable, and remove the whole apparatus bodily with its contents, when foul, to some distant spot, where it might be emptied without causing any nuisance—in a somewhat similar manner to the present system of taking out to sea the sewage-sludge of London and other large cities.

(*To be continued.*)

GROVES AND THORP'S "CHEMICAL TECHNOLOGY."

CONCLUDING NOTICE.

THE fact that the section of Groves and Thorp's text-book devoted to the subject of "Lamps" extends to ninety-two pages, and is studded with upwards of 140 illustrations, shows the importance attached by the Editors to this portion of the work. The author of the section is Mr. Boverton Redwood; and he has included oil gas, air-gas machines, and carburettors in the scheme of his labours. This circumstance should add greatly to the value of the book as a whole, particularly for gas engineers, especially since no comprehensive and critical work upon carburettors and cognate appliances exists. In treating of lamps, Mr. Redwood begins at the beginning with the Roman form, which suggests, as the author observes, that the primitive lamp was made out of a shell from the sea-shore or the skull of an animal. Lamps of classical form are still commonly used in olive-oil producing countries; and wretched affairs they are, for all their beauty of shape and interesting associations. They give a miserably poor glimmer of light; and the flame is extinguished by the faintest puff of air. As domestic conveniences, they are excelled by the northern rushlight. The line of lamp improvement followed by Mr. Redwood is that which had for its object the maintenance of a constant oil-level, which quickly leads him to the moderator and the carcel. He then retraces his steps, and recounts the efforts made to eliminate the shadow of the oil reservoir, and to improve the supply of air to the flame. The author hardly lays sufficient stress upon the revolution brought about in lamp manufacture by the introduction of glass chimneys, the credit for which apparently belongs to Argand.

The evolution of the mineral oil lamp has a chapter to itself, which is quite deserved; for although to casual inspection there would not appear to be any radical difference of type between the lamp used for burning fixed oils and the similar appliance adapted to burn mineral oil, the essential distinctions between the characteristics of the two kinds of fuel are paralleled in the constructive features of the respective lamps. It is one thing to burn, by means of a wick, a vegetable or mineral oil which will not ignite of itself in bulk, and does not give off inflammable vapour at the temperatures attained in the reservoir of the lamp, and a totally different task to burn safely and regularly, by the same means, a fluid comparatively volatile, easily rendered explosive by the heat developed in its own burning, and heavily loaded with carbon. The first mineral oil lamps that were used to any great extent were the so-called "camphine" lamps, with which the name of Young is identified; and, from this starting-point, Mr. Redwood quickly runs through the improvements in this class of lamps introduced by the Youngs, Hinks, Rowatt, Silber, and others. After describing and illustrating the mineral oil lamp in its principal commercial patterns, the author devotes another chapter to the explanation of the principles that should govern their construction, and discusses lamp accidents and their prevention. He maintains the view that the safety of lamp lighting depends upon very much more than the flash-point of the oil; and he gives his reasons for this opinion.

On the subject of the lighting value to be obtained from mineral oil, Mr. Redwood has some interesting information to give—the fruit of experiments extending over a long series of years. This effect is wholly a question of the lamp; the Argand type giving more light per unit of oil than flat-wick burners. The minimum consumption of oil per candle light per hour in the case of flat-wick burners is ordinarily about 50 grains, as compared with about 41 grains in the case of Argand burners. As the result of experiments made in 1879, it was found that, with the leading patterns of lamps then in use, the consumption of oil ranged from about 45 grains to 65 grains per candle light per hour; while a series of not strictly comparable experiments made more recently exhibit a range from about 41 grains to more than 70 grains. It does not appear from these figures that the useful duty of mineral oil lamps is being noticeably improved upon. The air supply to lamp flames, and the subject of wicks, are discussed by Mr. Redwood in separate chapters. It is recognized that a very important precaution in preparing a lamp for use is that of thoroughly drying the wick; moisture in the cotton greatly impairing its capillary properties. Spirit vapour and air-blast lamps are described and illustrated from good modern examples.

In dealing with the subject of oil gas, Mr. Redwood truly remarks that "this important illuminating agent may be considered as the forerunner of coal gas, although its employment was almost discontinued until quite recently." He omits to state, however, why this happened—an explanation which might easily have been given in a few words, and would have saved the neophyte in such studies from mystifying himself. Describing the manufacture of oil gas in retorts, Mr. Redwood observes that "the colour of the gas at the time of production should be nut brown; and the tar separated from the gas in its passage through the hydraulic main should, when dropped on white paper, not exhibit a greasy margin. If the oil be supplied to the retort too abundantly, or if the temperature of the retort be insufficiently high, the gas will be light brown or white in colour; and the greasy margin referred to will be formed. On the other hand, if too little oil be passed into the retort, or if the temperature of the retort be too high, the colour of the gas will be dark brown, and flakes of soot will be discernible." There is hardly sufficient distinction made here between the different colours which samples of crude oil gas can exhibit. The gas only passes from brown to white through several distinct shades of yellow; and it is one of these—rather than "nut brown"—that is preferred by experts in the manufacture. Mr. Redwood gives the cost of oil gas "manufactured at Blackwall by the Trinity House authorities" at 10s. per 1000 cubic feet. This is certainly above the average cost at which the same gas is manufactured by the principal English Railway Companies.

In concluding his chapter on the subject, Mr. Redwood states that "practical experience has demonstrated that, with a view to the production of a permanent gas suitable for use in the enriching of coal gas, the dissociation of mineral oils can be most advantageously effected by the heating of the vapour in admixture with a gaseous vehicle, such as water gas." This is not correct. Mr. Redwood knows, or at any rate says, nothing about the Young and Bell oil gas. This is to be regretted, as the omission of any reference to this system of making oil gas

for use in the enrichment of coal gas, with the consequent disclosure of the existence of a difference between the photometric and enrichment value of the product, deprives his work of a reputation for completeness. Mr. Redwood has hardly had sufficient grip of the latest developments in this branch of the subject to qualify as an authority upon it. He seems to be aware of this; and he accordingly refers inquirers after further information to the communications of Professor Lewes, and the JOURNAL.

The chapter on carburetting and carburettors is not so full of matter as could have been wished; and what there is, is treated with an absence of the critical or informing spirit. Happily the Maxim arrangement is included; and consequently the student is enabled to learn how carburetting is done by a good modern apparatus. Curiously enough, Mr. Redwood omits to mention the use of "albo-carbon" for carburetting, which has been far and away the most popular device of the kind for gas consumers' use, before incandescent gas-burners came to supersede all other methods for obtaining a gas-light of the highest possible brilliancy. In his brief account of railway carriage lamps, Mr. Redwood should have found space for mention of the Clark regenerative lamp, which had so much to do with the development of this principle in lamp construction.

A section, which bears the joint names of Mr. Boverton Redwood and Mr. D. A. Louis, is devoted to miners' safety-lamps and the conditions attending their use in fiery mines and other situations where the atmosphere is explosive. A circumstance which has always struck us as unaccountable—the fact of the precursor of the safety-lamp having been the machine known as the "steel mill"—is mentioned and slightly discussed by the authors in passing. Why a stream of sparks, generated by the friction of a piece of flint and a steel disc, should be employable with even a colourable amount of security in a fiery mine has always been a mystery, seeing that many a gas explosion has been traceable to ignition by a spark. It is noted here that experiments made for the information of Her Majesty's Chief Inspector of Explosives have indicated that an explosive mixture of petroleum vapour and air cannot be ignited by an ordinary spark. There are evidently, therefore, sparks and sparks; because the high temperature electric spark will ignite any explosive gaseous mixture, while so long as the temperature of the spark of flint and steel can be kept down below an undefined limit, it will not ignite anything of the kind. The description of the "Davy" type of safety-lamp in this volume effectually disposes of the notion which readers of books of "popular" science are apt to get hold of, that the safety lamp sprang in a state of perfection from the hands of the illustrious philosopher. Like every other product of human ingenuity, the safety-lamp is the product of accumulated effort; the merit of Davy being that of prescribing the fundamental principles, by observing which a flame might be caused to burn in an enclosed lamp, in a fiery atmosphere. This was a great thing to do; but infinite perseverance and patience were required to embody the principles in a practicable lamp. The section includes much information respecting the means whereby the presence of inflammable gas or vapour in the atmosphere may be detected, by the appearance of the safety-lamp flame or otherwise.

In concluding our notice of Messrs. Groves and Thorp's new volume, we desire to repeat what has been said in the course of our articles with regard to the general excellence and value of the work. It is, besides, well printed, illustrated, and indexed. As already remarked, Mr. Redwood's chapters on oil gas and the carburetting of coal gas need supplementing by references to the contents of the recent volumes of the JOURNAL; but this is the severest criticism we have to pass upon the work, which should certainly find a place upon the shelves of every gas engineer's technical library.

Gas-Engines for Electric Lighting Plant in America.—At Danbury (Conn.), gas-engines have been in use for driving the dynamos of the Gas and Electric Lighting Company. There are three 100-horse power engines of the "Otto" type, two-cylinder, single-acting; the cylinders being placed one over the other, with connecting-rods engaging a single crank. The engines were placed side by side, with the crank-shafts in line; and to extensions of these shafts there were fitted clutches, so that the engines could be coupled together with the cranks 180° or 120° apart. At first the engines were arranged to regulate the power by either admitting a full charge of gas or cutting it off altogether, as the load increased or diminished. Experiment showed, however, that with the producer gas it was possible, by regulating the quantity of gas admitted to the cylinders per impulse, to obtain impulses varying considerably in power; that it was possible to ignite a very weak mixture of gas and air; and that the loss of economy due to the use of a reduced charge of gas was not serious. The engines were subsequently fitted with conical governor cams, by which means the supply of gas per impulse is varied according to the power required. The producer gas used in the engines is made in two generators 5 feet diameter and 10 feet high, which are worked alternately day by day. The gas is of about 156 thermal units per cubic foot, at 0° C. and 76 mm. pressure. The engines are fitted with an attachment by which illuminating gas can be substituted for producer gas without stopping or reducing speed.

NOTES.

The Use of Breeze in Sewage Filtration.

Mr. W. J. Dibdin, the Chemist to the London County Council, has reported to this authority upon a series of experiments conducted for the Main Drainage Committee, with a view to ascertaining the best method of filtering the sewage effluent from the Northern Outfall precipitation works. The operations began in June, 1892; and by the month of August of the same year, it had been found that the best filtering material that could be obtained was coke breeze. The condition of success of the various materials experimented with, was discovered to consist simply in porosity and the consequent power of reabsorbing atmospheric oxygen. The object aimed at in these trials was the attainment of the highest rate of speed of filtration, consistent with such a degree of purification as would remove all objection in respect of odour, colour, and liability to after putrefaction. In a second series of experiments, every filter covered an area of one acre. By observing an intermittent course of charging and aëration, it was found that an acre of coke breeze could be made to pass an average of a million gallons of effluent per day, for many weeks. Nitrification proceeded satisfactorily; and the filter was apparently capable of continuing to work for an indefinite time. Great importance attaches to the fact that the filter worked satisfactorily all through the extraordinary frost of the early part of the present year. The experiments are summed up by the *Engineer* as representing a gain of knowledge of the method of treating sewage of the highest practical importance. It is reported that, by the aid of coke breeze, sewage, especially if previously clarified by precipitation, may be purified to any desired degree. If a purification of 75 per cent. is regarded as sufficient, the area required for the treatment of the whole of the Metropolitan sewage in this way is only 180 acres; and Mr. Dibdin shows how the area may even be reduced to 120 acres. In either case, carefully managed filter-beds take the place of open land, and costly sewage farms can be dispensed with. Experiments with sewage undiluted by rainfall, conducted by the local authority of Sutton, in Surrey, go to confirm these Metropolitan results. Thus the humble agency of coke breeze, manipulated in accordance with the teaching of biological science, will be efficacious in saving millions sterling for the ratepayers of the United Kingdom, and solving a sanitary problem of the first magnitude, and hitherto of the greatest difficulty.

The Conditions of Success in Electric Heating.

Mr. W. S. Hadaway discusses what he describes as "the new science of electric heating" in a recent number of the *Engineering Review*. He observes that any system of heat and electricity generation and transmission, derives its value largely from the benefits of concentrated control, like other systems of public works. We are to regard heat agents as commodities which can be economically generated, transmitted, and applied. Electricity as a heat agent is not to be regarded as a source of heat, as the expression is generally understood; but, technically, as the high-potential heat factor in a telethermal system, where the heat obtained is generated by simple resistance, or the electricity may be employed as an agent for producing available heat by operating a thermal engine by means of motors. Mr. Hadaway thinks that high-potential electrical heating might be easily combined with low-potential heating obtained from the exhaust steam of the electrical generating station. This he calls a multi-potential thermal system, because all heat required at a temperature above 212° Fahr. would be derived from the electricity, and all heating below this figure from the steam. This system, of course, involves a highly concentrated supply district. In sketching it out, however, the author has arrived at one or two interesting determinations—such as that in a multi-potential thermal system, the useful heat available is practically five parts low-potential heat and one part high-potential heat. In domestic life, the ratio of heats required is found to be practically five parts diffused heat, and one part high temperature heat. Hence he derives the conclusion that, over limited distances, it is possible to economically operate multi-potential heating systems, using electricity as the high potential factor.

The Defect of Internal Combustion Engines.

In a notice of the prime motors of the day exhibited at the last Royal Agricultural Society's show, at Darlington, the *Engineer* remarks that for none of them can be claimed that marked advance towards the realization of the higher thermodynamic efficiency, of the possibility of which there is no doubt. At present, the range of temperature which attends the combustion of oil vapour or gas is greater than is dynamically available; and the forced dissipation of heat, which is the necessary bye-product of the required process, remains much the same in engines of the several systems, whether this dissipation be effected or sought by transference to a water jacket, by radiation from radiator surfaces, or by rejection through the exhaust. The heat thus purposely thrown away remains almost as great as two years or more ago; and internal vapourization by the bye-product heat does not bring about that thermal advantage that might be naturally expected. Curiously enough, it is found cheaper in connection with certain oil-engines to burn an external lamp consuming oil for the ignition-tube and for supplementary heating of the vapourizer, than to use an

engine which does not require such assistance and consumes every drop of oil as combustible energy-yielding material. It is complained that at present the academic writings on the subject have done as much to hinder the development of the oil-engine as to help it, and that little has been written which in any way assists the inventor and practical experimentalist. It is the weakness of thermo-dynamic theory to be only wise after the event.

The Dividend of The Gaslight and Coke Company.—We learn from the Secretary and General Manager of The Gaslight and Coke Company (Mr. J. W. Field) that the balance to the credit of the net revenue account will, subject to audit, enable the Directors to recommend the payment of a dividend for the half year ending June 30 last at the rate of 12¾ per cent. per annum; carrying forward a balance of £256,800 19s. 1d. The dividend is an increase of ¾ per cent. as compared with the two preceding half years, when the balances carried forward were £255,254 and £239,791 respectively; and, moreover, the price of gas has been reduced and meter-rental abolished.

A Shareholder's Complaint.—Mr. John Miles, a shareholder of the Hornsey Gas Company, is addressing his fellow-shareholders on the subject of what he regards as the unjust policy pursued by the Board in reducing the price of gas to consumers without allowing the proprietors to participate in an increased dividend. He hopes thereby to secure a good attendance at the next meeting of the Company, when some questions will be put to the Directors on the matter. The ground of Mr. Miles's complaint is that whereas the Company have the power, having reduced their price 7d. per 1000 cubic feet, to pay 11¾ and 8¾ per cent. on the two classes of stocks, they continue the dividends at 10 and 7 per cent.—the rates payable if no concession had been granted to the consumers. Mr. Miles asserts that not only is this policy unfair to the shareholders, but is prejudicial to the value of the Company's stock on the market. In support of this statement, he cites the case of the Tottenham and Edmonton Gas Company, who, while paying ¼ per cent. less dividend than, as he contends, the Hornsey Company could declare, lately sold £20,000 of 7 per cent. stock at such a figure as to produce £15,000 premium; whereas £10,000 of similar stock of the Hornsey Company only brought them £4400 premium—both undertakings being equally sound and prosperous. We are not in a position to-day to discuss the policy of the Board of the Hornsey Gas Company. Mr. Miles seems to have cause for complaint; but, on the other hand, the Directors may be able—and there are capable men on the Board—to justify their action. The shareholders would do well to take the advice offered to them, and attend the next general meeting. It is not customary for reporters to be admitted to meetings of this Company; but, if an exception were made on the next occasion, good might result to other undertakings than the one specially concerned.

The Gas and Water Interests in the New Parliament.—As far as the returns have come to hand, the gas and water interests will be fairly well represented in the Parliament which will assemble at the close of the General Election now in progress. For the first time, we believe, in the history of the gas industry, a practical gas engineer will take his seat in the House of Commons. Mr. D. Ford Goddard, formerly the Engineer and General Manager, and now a Director, of the Ipswich Gas Company, and Chairman of the South African Lighting Association and of the Gas Purification and Chemical Company, has been returned for that borough at the top of the poll with 4396 votes; his colleague, Sir Charles Dalrymple, Bart., polling 4293 votes. Mr. Goddard unsuccessfully contested the borough in the Radical interest in 1892, when he polled 4054 votes. He is a member of the Ipswich Corporation; and he was elected Mayor in 1891, but resigned in order to seek the suffrages of the electors. Sir Julian Goldsmid, who, in his capacity of Chairman of the Imperial Continental Gas Association, occupies a conspicuous position in connection with the business of gas supply on the Continent, retains his seat for South St. Pancras. Mr. John Aird, the head of the firm of Messrs. John Aird and Sons, and a Director of The Gaslight and Coke Company, who is engaged not only in the conduct, but also in the carrying out of gas and water works, will continue to represent North Paddington; and Mr. W. Woodall has been again returned for Hanley. Colonel Sadler, known the world over as a chemical manufacturer, and the Past-President of the North of England Association of Gas Managers, was unfortunately not successful in defeating Mr. J. Havelock Wilson at Middlesbrough; but Mr. J. E. Spencer goes back unopposed for West Bromwich. With regard to water supply, Mr. F. G. Banbury holds his seat for Peckham; and Mr. Boulnois his for East Marylebone. As connected with the legislation affecting both gas and water undertakings, we may mention that Mr. C. A. Cripps, Q.C., has been returned for Stroud, and Mr. J. Shiress Will, Q.C., for Montrose Burghs. Mr. James Rowlands, whose name came prominently before our readers in connection with the recent agitation in regard to the charge for gas in the Metropolis, will no longer represent Finsbury. Mr. G. Howell and Mr. Keir Hardie, the well-known Labour candidates, have lost their seats for Bethnal Green and West Ham; but Mr. John Burns, Mr. T. Burt, and Mr. H. Broadhurst, other Labour candidates, will continue to sit for Battersea, Morpeth, and Leicester.

TECHNICAL RECORD.

COMMUNICATIONS FROM THE CHEMICO-TECHNICAL SECTION OF THE TECHNICAL COLLEGE OF CARLSRUHE.

By Dr. H. Bunte.

We have received from Dr. Bunte a copy of his preliminary report on work now in progress at the Carlsruhe Technical College. The subjects dealt with are all of interest to gas engineers; and in the following abstract-translation of the paper, we follow the author's grouping of his matter under three heads:—

I.—*The Products of Combustion of Gas-Flames.*

The constantly recurring assertion of the detriment to health of gas lighting, and the statements of some chemists that ordinary batswing and Argand burners yield carbonic oxide, have given occasion for a fresh consideration of the question. Since this investigation was undertaken, many other experimentalists—among whom Renck, Grehant, and Geelmuyden may be mentioned—have attacked the problem, especially with reference to incandescent lighting; but their methods were dissimilar in many respects to those used at Carlsruhe; and this investigation deals also with flames for heating purposes, as well as for lighting. The experiments described here were conducted by Herr A. Weber and Dr. Haber.

The endeavour was made, on the one hand, in no way to disturb the normal form of the flame; and, on the other hand, to keep the products of combustion as far as possible from dilution with air before analysis. A metal funnel was inverted over the flame, as closely to it as possible without affecting the draught; and any desired proportion of the products of combustion was drawn off through a side limb on the stem of the funnel. The products of combustion pass into the body of the funnel, and escape round the brim; and without interference with the flame, a portion of the gases can be drawn into a reservoir.

Some experiments were made on flames burning within a chimney, and on the verge of smoking, to determine how great an excess of air was drawn through the chimney under these conditions. A burner of the "London Argand" pattern, consuming 5 cubic feet per hour, and two petroleum lamps with cylindrical burners—one with, and one without deflecting disc—were used. There was 11·1 per cent. of carbonic acid and 3·8 per cent. of oxygen with the Argand burner; and 9·9 and 9·6 per cent. of carbonic acid, and 7·3 and 7·9 per cent. of oxygen with the two petroleum lamps, in the chimney gases—giving co-efficients of 1·2 for the Argand and 1·5 and 1·55 for the petroleum lamps, to represent the excess of air. Therefore the air is relatively very completely used up in the Argand burner with the flame on the verge of smoking. The conditions are different with the incandescent light, where combustion follows the admixture with air in the Bunsen burner-tube. The zone of most intense combustion should coincide with the surface of the mantle, to give the greatest brightness. With a well-regulated burner, there was found, at a point 5 mm. above the mantle support, 12·6 per cent. of carbonic acid and 0·3 per cent. of oxygen, showing therefore only a small excess of air; while towards the interior, products of incomplete combustion were found—for example, 3·8 per cent. of carbonic oxide. Directly the flame has penetrated the mantle, the last of the carbonic oxide disappears; and therefore the mantle is, as it were, enveloped in flame. Besides the air used for the combustion, a tolerably large excess is drawn through the chimney; so that the exit gases show a much lower percentage of carbonic acid. With a large number of various incandescent burners, from 4·7 to 7·4 per cent. was found; and the large excess of air drawn up, and the high temperature prevailing, preclude the possibility of a trace of incompletely burnt gas escaping.

For the solving of the main problem, whether products of imperfect combustion occur in the exit gas, a portion of this gas was led through a train of apparatus in which the carbonic acid and water were first absorbed. Incompletely burnt gas was then consumed, by being passed through a capillary containing incandescent copper oxide; and the products were passed into a weighed apparatus. Ten incandescent burners, with the mantles in varying states of preservation, were used; and an Argand, a hollow-top batswing burner, and a cylindrical petroleum lamp were also thus investigated. Calculating into percentages of carbonic oxide in the undiluted exit gases, it was found in most cases that the amount was expressed in thousandths of a volume per cent. only; and consequently it was within the limit of experimental error. Therefore the combustion must be regarded as perfect with these various burners. If it is remembered that, under ordinary conditions, these products of combustion are mixed with large quantities of air, the futility of attempting an exact estimation of such products in the air of a room is obvious; and it may be concluded, on the evidence afforded by these investigations, that the ordinary gas-flame under normal conditions, and the incandescent light also, yield no quantitatively determinable amount of products of imperfect combustion.

Flames used for heating by direct contact with the bodies to be heated, must necessarily be furnished by gas previously

admixed with air; and the greater the proportion of this primary air, the less is the supply of air—secondary air—subsequently needed. This principle was first applied in the Bunsen burner. There is, however, a limit to the amount of air that can be mixed with the gas before combustion; as beyond a certain degree of dilution—viz., about 80 parts of air to 20 parts of gas—the mixture becomes explosive. Therefore, practically, less than 80 per cent. of air must be mixed with the gas. But the more nearly this limit is approached, the more certain becomes complete combustion of the gas. A first-class German burner proved to have nearly attained this maximum admissible air supply, and combustion was complete; but a burner of French origin, with too small an air supply, allowed appreciable quantities of unburnt gases to escape.

For the collection of the products of combustion from heating burners, a flat-bottomed circular vessel, with water circulation, was placed over the ring of burners, so that the spent gases passed into the space between the vertical wall of the vessel and an eaves-like metal plate, which was soldered to the wall at its upper edge, and projected beyond it at its lower edge. The gases were drawn off from this space through a tube, in the same manner as from the funnel already described; and the examination for incompletely-consumed gas was made in a similar way. In order to equalize as far as possible the conditions for all the burners, the consumption was regulated to give from 6 to 7 per cent. of carbonic acid in the spent gases in all cases. Two German and two French types of boiling apparatus were tested, as was also a Bunsen burner with Teclu air-regulator.* In the experiments with the boiling apparatus, with 76·1 per cent. of air, 0·029 per cent. of carbonic oxide was found in the spent gas; with 74·2 per cent. of air, 0·072 per cent.; with 60·07 per cent. of air, 0·468 per cent.; and with 51·5 per cent. of air, 0·546 per cent. The effect of the too small proportion of the air in permitting carbonic oxide to escape unburnt, is very marked in the last two cases. The Teclu burner, with a nearly explosive mixture containing 80 per cent. of air, yielded in the products of combustion only 0·04 per cent. of carbonic oxide; with 65·6 per cent. of air, 0·23 per cent.; and with only 21·8 per cent. of air, 0·51 per cent.—the carbonic acid in all three instances averaging about 6·5 per cent. Seven different incandescent burners were then examined in like manner; and it was found that, in all of them, the mixture of gas and air in the Bunsen tube contained over 70 per cent. of air, which approaches very nearly the proportion theoretically most conducive to perfect combustion.

II.—*Tests of Various Incandescent Burners.*

The large number of incandescent burners now competing in Germany with the Welsbach burner of the German Incandescent Light Company, rendered desirable a series of observations as to their durability and lighting power over a considerable period. To obtain strictly comparable results, eight burners were fitted to one pipe, which, by means of knuckle-joints, could be turned so that any burner was brought into position on the photometer-table without further adjustment. In addition to the gas supply from the common service, which could be shut off from any burner by means of taps, each burner was provided with a side supply, by means of which the gas consumed during photometrical observations could be measured before admission to the burner. The whole of the lights burnt under precisely similar conditions; and at certain intervals—generally once a day—all were extinguished, and each in turn supplied from the experimental meter, and tested on the photometer. The Hefner lamp was used as the standard of comparison; and ten readings were taken with each burner, which was during the course of the observations turned three times by about 120° on its axis.

The tests were carried out by Dr. Scharrer; and the results obtained with fourteen different burners are tabulated. The burners and mantles were in most cases bought in the ordinary way; and generally three mantles were tried with each burner. Every mantle was tested with the burner for which it was devised. With eight burners, the observations have already been continued up to 1000 burning hours, or until the light failed. Four only of these were efficient at the end of that period; and they had a greatly diminished illuminating value. A burner made by Tobias Forster and Co., of Munich, gave perhaps the best result; but that of the German Incandescent Light Company was practically equal to it. One made by Fischer and Co., of Mayence, and one by Gericke and Co., of Berlin, showed less initial lighting power; but at the end of 1000 hours, it gave almost similar values to the two first mentioned. The next series of observations on six burners is not yet complete. A detailed account of the behaviour of each burner cannot yet be given; but it may be remarked that the rise in lighting value occasionally observed after many hours' use is to be ascribed chiefly to change of shape of the mantle, though fluctuations in the gas pressure often cause considerable variations.

Experiments are in progress on the nature and chemical composition of the mantles. It may provisionally be said that the weight of the various mantles is very similar. The total weight is about 4 grammes, of which nearly 90 per cent. is that of the muslin, and only about 10 per cent. that of the earthy mantle which remains on incineration. Though the results with other burners show that the original Welsbach is still foremost in respect of illuminating power, durability, and uniformity, nevertheless the efforts of other inventors to compete with it have not been without good result.

* See JOURNAL, Vol. LXII., p. 849.

III.—*Carburetting.*

The earlier communications of the author on carburetting* have chiefly treated of the enrichment of coal gas by means of various hydrocarbons, which are on the market in more or less abundance at moderate prices. Benzol is the most generally acceptable of these hydrocarbons, and, under present conditions, is very economical. It has now been practically used, not only in Germany, but also in England and France. As it has proved quite suitable, and as the apparatus is simple and readily adapted to various conditions, a large extension of carburetting with benzol may be anticipated. For some time past, apparatus for carburetting on a large scale has been at work, and has given satisfaction—indeed, it is found that the consumption of benzol for a given degree of enrichment is lower than on the experimental scale. The raising of illuminating power by benzol depends on a large number of conditions—such as the composition of the gas enriched, the method of consumption, and the burner used.

In the early experiments, the effect of benzol and other hydrocarbons was studied exclusively on coal gas disillumined by means of fuming sulphuric acid. It appeared interesting to observe the effect of different carburetting agents on water gas, and on each of the constituents—*i.e.*, hydrogen and carbonic oxide—of the latter separately. Herr L. Walther undertook this investigation. The experiments were so carried out that benzol, toluol, pentane, and hexane, the typical hydrocarbons used, were added to the gas in such quantity that, for a consumption of about 100 litres (3·53 cubic feet) per hour in a hollow top batswing burner, an illuminating power of about 10 to 12 Hefner units (8·8 to 10·5 English candles) was obtained. Different burners were tried in each case, in order to obtain a favourable result; this being an especially necessary precaution, as the specific gravities and rates of combustion of hydrogen and carbonic oxide are so divergent. The results obtained with hydrogen, carbonic oxide, and water gas, and benzol, toluol, pentane, and hexane, are given in the following table:—

Gas Examined.	Consumption of Carburetting Agent per English Candle per Hour.			
	Aromatic Hydrocarbons.		Paraffins.	
	Benzol.	Toluol.	Pentane.	Hexane.
Hydrogen	16·90 grs.	19·00 grs.	64·50 grs.	60·30 grs.
Carbonic oxide . .	23·05 ,,	22·15 ,,	99·20 ,,	89·90 ,,
Water gas	19·20 ,,	17·60 ,,	81·60 ,,	67·60 ,,

To complete the series, the experiments should be extended to methane.

A comparison of these figures with those previously found for the carburetting of disillumined coal gas with which only about 8·8 grains of benzol or toluol, or 31·7 grains of pentane or hexane were needed per candle per hour, will show that with hydrogen the quantities required are about double, and with carbonic oxide about treble those with the coal-gas residue. On a working scale, too, the figures for coal gas are even lower. Though the statement occasionally made, that water gas cannot be carburetted with benzol, is untenable, yet a far larger expenditure of enriching material is needed with water gas than with disillumined—*i.e.*, feebly illuminating—coal gas, for a given accession of luminosity. The explanation evidently lies in the fact that about one-third of the coal gas consists of methane, the heating power of which develops the full illuminating value of the hydrocarbons. There is little difference in the enriching power of the different members of the same series of hydrocarbons; but there is considerable difference between members of the aromatic and those of the paraffin series. In accordance with former results, for the same enrichment, there is needed of a paraffin (pentane) three or four times the quantity that is required of an aromatic hydrocarbon (benzol). This fact greatly favours the employment of benzol and the homologous hydrocarbons.

The experience of many years proves that, with the use of either crude petroleum (naphtha) or pure paraffins, a considerable increase of illuminating power can be obtained by "fixing" or "superheating"—that is, by a partial breaking up of the hydrocarbons; and this method is generally used in the American water-gas processes. To ascertain the effect of this superheating on the volume and illuminating power of carburetted gas, experiments were made by heating to about 600° C. hydrogen and water gas which had been previously charged with pentane vapour. The results are contained in the next table.

* See JOURNAL, Vol. LXII., p. 717; and Vol. LXIII., p. 484.

Experiments on the Fixing of Hydrogen and Water Gas Carburetted with Pentane.

	Pentane in 100 Litres (3·53 C. Ft.) of Gas.	Illuminating Power of Unfixed Gas per 100 Litres.	Fixed Gas.		Accession of Illuminating Power to 100 Litres of Unfixed Gas.	Temperature of Fixing.
			Volume from 100 Litres.	Illuminating Power per 100 Litres.		
	Grains.	English Candles.	Litres.	English Candles.	English Candles.	Deg. Fahr.
Hydrogen.	872	16·2	120	14·6	1·3	950
	"	"	—	15·0	1·8	1100
	"	"	—	15·8	2·8	1100–1200
	1131	21 4	120	20 9	3 7	930
	"	"	130	20·6	5·4	1130
	1363	23 4	110	23·4	2·3	930
	"	"	120	22·5	3·6	1100
	"	"	130	24·1	7·9	1100–1200
Water Gas.	644	9·5	114	11 2	3 3	930
	"	"	124	10·4	3·4	1100
	1042	18·9	119	21·6	6 8	930
	"	"	122	22·5	8·5	1100
			124	21·5	7 8	1100–1200

These figures, which need checking and amplifying in several directions, show that in the "fixing" process a breaking up of the hydrocarbons occurs, with an increase of volume amounting to from 20 or 30 per cent., according to circumstances. Generally the absolute lighting power of the gas is reduced; but having regard to the volume of the unfixed gas, it will be seen that there is really a gain in lighting power, which, under the above experimental conditions, was greatest at 1100° to 1200° Fahr. The nature of the changes brought about by the "fixing" could not be established from the fixed gas, as the dilution renders it almost impossible to isolate single gaseous constituents.

Experiments have been undertaken by Dr. Haber and Herren Samoilowitz and Oechelhäuser, on the decomposition by heat of the undiluted hydrocarbons, especially hexane. They are not yet completed; and provisionally it can only be said that, by the decomposition of paraffin hydrocarbons, such as hexane, only very small amounts—scarcely 2 per cent.—of aromatic hydrocarbons and acetylene result, and the reaction that very possibly occurs is the formation of homologues of ethylene with the splitting off of methane. Further results of the experiments will be reported later.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Annual Congress in Paris.

The Twenty-second Annual Congress of this Society was held in Paris from the 17th to the 19th ult., under the presidency of M. DE LACHOMETTE. The meeting has already been noticed in the JOURNAL (*ante*, p. 75); and the following abstract report of the proceedings is translated from the *Journal des Usines à Gaz*, the official organ of the Society.

There were about 125 members present when the chair was taken on the morning of the 17th ult. The first business was the adoption of the report of the meeting held at Nîmes last year, as contained in the published Transactions of the Society. Next came the admission of new members and associates, of whom there were 23 and 7 respectively; the President of The Gas Institute for next year (Mr. W. R. Chester) being elected an honorary member. The report of the Committee was then presented by the President. It referred to the loss of 13 members by death; sympathetic allusion being made to the decease of Mr. G. Garnett. Allowing for withdrawals and exclusions, the total number of members at the close of the year was 611, divided as follows: Honorary members, 16; ordinary members, 498; and associates, 97. The contributions made to the funds of the Society by gas companies and firms amounted to 22,230 frs. (£889); being a slight falling off as compared with the preceding year. The Treasurer (M. Deleury) likewise submitted his report. It showed that at the close of the year 1894 the capital had risen to 165,055 frs. (£6602); being an increase of 17,261 frs. (£690) during the twelve months. The next business was the election of eight members of the Committee, five to replace those retiring—MM. Brouardel, Deleury, Monnier, Piaton, and Visinet, who were eligible for re-election—and three to take the positions vacated by M. de Lachomette (the retiring President), M. des Gouttes, whose name had been removed, and M. de Vigne, deceased. The result of the ballot was the restoration of MM. Visinet, Deleury, Piaton, and Brouardel to their places for three years; M. Alfred Lebon being substituted for M. Monnier, who was elected for two years, and MM. Thibaudet and Bigeard each for one year. This completed the general business at the morning sitting. The Committee afterwards held a meeting for the election of officers for the ensuing year. The following was the result:—

President . . . . . M. de Lachomette.
Vice-President . . . . M. Delahaye.
Secretaries . . . . . MM. Visinet and Frère.
Treasurer . . . . . M. Deleury.

At the afternoon sitting, there were 230 members present to hear M. de Lachomette deliver his address, of which the following is a full abstract translation:—

INAUGURAL ADDRESS.

The President began by remarking that most of the questions bearing upon the gas industry had been so ably dealt with on previous occasions, that his task was rendered especially difficult; and were it not for the respect he owed to tradition, he should certainly refrain from doing over again what had already been done so well. He felt that his hearers would lose nothing by this course; but they would certainly not be altogether pleased with him for setting a bad example which his successors might be tempted to follow, and possibly deprive the members of addresses full of talent and interest. He therefore proposed to review certain matters of daily practice, and offer a few suggestions as to the relations which should subsist between suppliers of gas and their customers, with the object of extending their business. He went on to remark that in the gas industry, as in many others, the commercial side has more consideration than the purely technical one; but he pointed out that, to ensure complete success, neither of these branches should be neglected to the advantage of the other. It was by the proper division of the gas manager's time, labour, and intelligence that efficient management in the works could be so combined with judicious administration of the outdoor business as to be productive of commercial success. It had been said that profits were made in the retort-house. It was therefore to their raw material—coal—that he would first direct his hearers' attention.

Without dwelling upon the various kinds of coal and their proper admixture, the President proceeded to consider the question of storage, which, he remarked, was one of primary importance, whether from the point of view of handling or of preservation. He said he was telling his colleagues nothing new in stating that coal stacked in the open air for a certain time loses both in the quantity and the quality of its constituent volatile matter, and yields, on carbonization, coke of very inferior character. This was a fact they had sometimes learnt to their cost. What, he asked, was the extent of these inconveniences; and what means should be employed to lessen their effects? It was in M. Henri Fayol's work "*Sur l'Altération et la Combustion Spontanée de la Houille exposée à l'Air*" that he had found the most complete solution of this twofold question. The application of the principles laid down by M. Fayol had led him (the President), after several years' experience, to the attainment of the best results; and he thought he should be doing useful work if he gave a summary of them.

Proceeding to deal at some length with this subject, the President referred first of all to the experiments carried out by M. Regnault with the coals of Anzin and Mons, as described in a report on "The Manufacture of Gas" published by him in 1855. Coals which had been tested twenty years previously, and preserved in flasks imperfectly corked, were submitted to fresh analysis, and the result showed that no change had taken place in their character—they had not suffered from any spontaneous decomposition appreciable by delicate tests. He did not deny that certain coals, principally those containing pyrites, might, when exposed to the air, become in time altered in composition, and unsuitable for the production of a good quality of coke; but in the case of the coal of Mons, no remarkable change was found by experiment even after ten months. Regnault therefore doubted that air has any prejudicial action on coals; although those containing pyrites appeared to him to be liable to change in the long run. M. de Marsilly was of opinion that fire-damp coal exposed to the air threw off carburetted hydrogen, and lost a portion of the properties necessary for the production of good coke.

After reviewing the conclusions come to by the Royal Commission appointed in 1876 to inquire into the causes of the spontaneous combustion of coal, and the doubts expressed by various authors as to the effect of pyrites, to which the Commission attached much importance, the President quoted the opinion expressed by M. Haton de la Goupillère, in 1878, in his report on the best means of preventing explosions of fire-damp. He considered that a very frequent cause of fire lay in the combustible itself, which was too often susceptible of spontaneous heating. Oxidation of the pyrites or of certain organic substances was often the primary cause.

Coming to the experiments of M. Fayol on various kinds of coal, the President made the following remarks: The conclusion arrived at by this investigator was that all coals exposed to the air absorb oxygen; and that this absorption is always followed by a more or less appreciable change of character. The volume absorbed may be equal to a hundred times that of the coal. Under the action of the atmosphere between 25° C. and 400° C., coals first lose a part of their weight, then recover what they have lost, and even add materially to their original weight. At the end of a certain time, at high temperatures, the weight again diminishes, and appears to have no power to stop its decrease. The loss and increase of weight are not the same in all coal; but the nature of the coal has no appreciable influence on these variations, as anthracites are found in the same rank as fat coals and lignites. The state of division of the coal has a notable influence on the alterations in weight. These changes are therefore produced more slowly when the coal is in large pieces.

Temperature plays the principal part. Each of the periods

of change of weight mentioned above is shorter and of more marked effect the higher the temperature. This is shown by the following table:—

	Temperature of the Air.			
	25° C.	50° C.	100° C.	200° C.
First Period.				
Maximum loss . .	0·53 p. ct.	0·81 p. ct.	1·50 p. ct.	1·60 p. ct.
Time	15 days	24 hours	12 hours	1 hour
Second Period.				
Total increase . .	0·20 p. ct.	0·20 p. ct.	4·70 p. ct.	5·00 p. ct.
Duration of exposure	150 days	150 days	240 days	8 days
Third Period.				
Loss	nil	nil	nil	30·00 p. ct.
Duration of exposure	240 days	240 days	240 days	240 days

The figures represent averages. In the case of anthracites, as well as of fat coals and lignites, increases in weight to the extent of 7, 8, and even 10 per cent. have been met with.

The increase in the weight of coal in air can only be attributed to two things—the absorption of gas or of water; and it results mainly from taking in the oxygen of the air. This is a chemical phenomenon, not a mechanical action. Generally, the action of the air makes itself apparent first by a slight increase, then by a gradual diminution, in the residue of calcination. With regard to the yield of gas, the action of air on coal has a contrary effect to that produced from the point of view of the yield of coke. After starting with a slight increase, an appreciable diminution ensues; then comes a further increase, which attains tolerably large proportions. This is shown by the following tables:—

Percentage of Residue after Calcination.

	25° C.	50° C.	100° C.	200° C.	400° C.
Before exposure . . .	72·75	72·75	72·75	72·75	72·75
After 1 day	74·60	74·40	74·10	76·00	72·30
,, 2 days	74·50	74·60	75·30	77·08	58·80
,, 4 ,, ...	74·60	75·10	75·80	72·60	28·00
,, 8 ,, ...	76·60	76·30	76·10	67·50	14·58
,, 15 ,, ...	78·10	77·40	77·20	64·35	Ash
,, 1 month . . .	79·60	78·20	77·10	59·80	..
,, 2 months . . .	79·80	80·30	76·30	57·80	..
,, 4 ,, . . .	77·70	77·10	74·60	49·60	..
,, 8 ,, . . .	77·11	76·69	70·50	39·20	..

Yield of Gas in Litres.

	25° C.	50° C.	100° C.	200° C.	400° C.
Before exposure . . .	26·36	26·36	26·36	26·36	26·36
After 1 day	26·70	24·80	24·85	25·30	19·50
,, 2 days	26·70	24·80	24·85	25·30	15·80
,, 4 ,, ...	26·50	24·60	24·60	25·30	6·60
,, 8 ,, ...	26·10	24·50	24·60	24·80	..
,, 15 ,, ...	25·70	24·90	24·80	24·70	..
,, 1 month . . .	25·10	25·10	26·70	23·60	..
,, 2 months . . .	24·40	26·00	26·70	23·90	..
,, 4 ,, . . .	26·80	27·10	27·80	23·80	..
,, 8 ,, . . .	29·15	30·34	29·50	23·45	..

The illuminating power diminishes very quickly by the exposure of the coal to the action of air and heat. This is shown by the following table:—

	100° C.*		200° C.		400° C.	
	Dust.	Grains.	Dust.	Grains.	Dust.	Grains.
	Days.	Days.	Days.	Days.	Hours.	Hours.
Anthracite coal . .	25	45	3	5	..	..
			Hours.			
Fat coal	55	55	12	15	3	12
Flaming coal . .	55	95	36	5	4	12
Lignite coal . . .	15	15	24	4	..	..

* At 25° C. and 50° C., the time was more than 240 days.

The lighting power lasts longer in the fat coals than in other kinds. It resists high temperatures for only a short time, and is maintained better in grains than in dust. Many experiments made with the coal of Commentry, in small pieces and in dust, which had remained for two years in water at the ordinary temperature, showed that this coal had undergone no appreciable change, either in appearance or in constitution. The same coal tested after 100 days' immersion in water at 80° C. to 90° C., showed that neither the agglomerating nor the lighting power had even then suffered diminution; while the look of the coal remained the same.

The principal facts arrived at may be summarized as follows: (1) Coal when exposed to the air changes in character—the change consisting in a diminution of agglomerating as well as of lighting power, and probably also of heating power. (2) The change is more rapid the higher the temperature, and the more divided the coal. (3) In the small pieces, the change in the character of the coal is greater on the surface than in the interior. In heaps of coal permeated by the air, the change is greater in the centre than on the surface. When the air cannot penetrate to the centre, the surface undergoes the greatest change. (4) Small coal washed is less liable to change than unwashed. (5) Large pieces of coal are only liable to change after a certain number of years' exposure to the air. The small coal is affected very quickly if it happens to be under conditions likely to raise its temperature. In a few months it is capable of entirely losing its agglomerating and lighting power. (6) Heaps of small coal become heated; but stacks of large coal do not heat to an appreciable degree. These explanations enable us to understand the results obtained by Regnault in his experiments already quoted, which led this illustrious scientist to express doubts as to the change undergone by coal exposed to the air.

From the foregoing considerations, it will be seen that the best means of preserving coal from change in its constitution is to protect it from the air, and keep it at a low temperature. Immersion in water would satisfy these two conditions; but this is rarely practicable. The same result may be obtained by enclosing the coal in an impermeable covering, composed of clay or fine dust. Small coal should not be stacked in too large heaps. Experience has shown: (1) that coal stacked in low heaps does not become heated; (2) that the heat increases with the height of the stack; and (3) that at about the height of 3 or 4 metres the temperature rises progressively, and then descends without having exceeded 60° C. or 70° C. At this height, it is usual to see steam issuing about the end of the third month; then follows a colourless gas having a strong odour like that of petroleum; and afterwards smoke appears near the top of the heap. If the heap is opened, white and yellow smoke comes out in large quantities; the temperature rises; and at about 300° C. ignition takes place. Combustion is checked by covering with coal dust the part which has become ignited. But distillation goes on; and the coal soon loses its volatile properties, and is transformed into a very light puffy coke. Ventilation of the interior of stacks of coal, by means of bundles of faggots, has been tried. When these have been well arranged, combustion has been prevented; but when placed irregularly, fire has occurred much sooner than in heaps not so treated. Ventilation by this means is therefore not the best method of preserving coal from taking fire. A surer way is to make the heaps smaller. The inner temperature of a stack 2 metres high does not usually exceed 40° C. to 50° C.

These extracts enable us to appreciate the importance of M. Fayol's experiments; and they afford considerable help. All gas-works have not the necessary space to allow of coal being stored in low heaps; but, whenever this is possible, advantage will always follow. And in order to realize it, the necessary expense must not be spared. But whatever arrangements are adopted, a sharp look-out should be kept on the temperature of the stack. A very simple method of ascertaining this is to insert iron rods, which can be drawn out from time to time, and their temperature found approximately by the hand. Apart from the stacking of coal, there is its carriage from the store to the retort-house, which, in large works, calls for the exercise of much foresight.

Coming now to carbonization, the President remarked that attention should be given to the following points: The temperature of the ovens, the stanchness of the retorts; and the pressure in them. With regard to heating, generator furnaces with recuperation offer undeniable advantages. These appear not only in the reduction of the quantity of fuel consumed, but in the facility they afford for keeping up the fires and for regular working. Skilled firemen are not necessary; and by regulating the dampers the required temperature can be secured by the manager himself. This system of heating is destined to become general in both small and large works. The stanchness of the retorts does not depend solely upon their quality, but also upon the precautions taken in setting them. Great care should be exercised in this work, as well as in the selection of the material employed in the construction of the furnace. Retort-settings have to be kept at work for several months in succession; and a retort out of action reduces the producing power of the furnace, and increases the proportion of fuel employed. When an accident happens, the cause should always be sought without any preconceived opinion. In support of this very trite remark, the President recalled to his hearers' minds the communication made to the Society by M. Meizel in regard to the method employed at the gas-works at St. Etienne to prevent the cracking and breakage of retorts. When the fires were started, and after a few days' working, it often happened that one or more retorts were found to be cracked or split perpendicularly to their length; and this notwithstanding that the greatest precautions had been taken when lighting up. Meizel was led to inquire as to whether these accidents did not arise from causes preceding the firing up. In examining the unfired furnaces contiguous to those in use, he noticed that several retorts were already split. The same result followed each observation, which was repeated a number of times. The breakages were due to forcing the neighbouring furnace fires after they had been lighted. The following method was therefore adopted: Instead of quite completing the front wall, it was only finished for the two furnaces placed back to back, situated at one end of the row, and first lighted; and with regard to the others, an uncompleted band, something like 25 centimetres wide, was left from top to

bottom and at each side of the furnaces. The wall was not finished until the furnaces were lit. Before these precautions were taken, the proportion of broken retorts rose to an average of 28 per cent. for seven years. After they were adopted, and during a period of four years, only 2·65 per cent. of broken or cracked retorts were found.

The pressure of gas in the retorts in works where no exhausters are employed would be the same as it is in the holders, in addition to the resistances caused by the pipes and the various portions of the plant. Great care should be taken to reduce these pressures by providing ample room for the passage of the gas, and avoiding obstructions, especially in the condensing and purifying plant, and by so counterbalancing the gasholders as to reduce their weight to the minimum necessary to ensure the proper pressure in the mains. The adoption of exhausters enables these resistances to be overcome. Their employment is not general in small works, especially in those located in places where the price of coal is high. The kind mostly used is the rotary or Beale type. Steam-jet exhausters, which were greatly in vogue at the time of their invention, are economically fitted up and easily maintained when the steam for working them can be produced by the waste heat of the furnaces; but there is now a tendency to put them aside, since the employment of gas-heated furnaces renders more difficult the production of steam in the way indicated. Rotary exhausters are being again used; and this is justified by the ease with which they are driven by means of gas-engines. In small works, where economy should be the first consideration, the engine could be utilized at the same time to run the washer, the pumps, the coke-breaker, and the repairing plant in a small workshop. The gas-engine should be employed in preference to the steam-engine, even where fuel is cheap, because it can be more easily looked after; and, moreover, it affords an excellent opportunity, which should not be neglected, of setting a good example to customers by employing ourselves what we recommend them to adopt.

All that has been written on condensation and purification shows that ideas are far from being exhausted on these two questions. The first of these subjects will be dealt with in a paper by one of our colleagues; and I will say a few words only on naphthalene—that bugbear of our business. I believe that the reactions which cause its formation take place exclusively during the distillation of the coal in the retort; and that, contrary to certain beliefs, it is not formed afterwards. If that is so, the cooling of the gas or mechanical absorption should suffice to get rid of the trouble once for all. This reflection is suggested by the following occurrence: In 1872, the Vaise Gas-Works were provided with only a small extent of purifying plant and sheds for the revivification of the spent oxide. It was thought to effect the latter operation by subjecting the material to a current of steam on its removal from the purifiers; and the process was carried on in a kind of lime-kiln. It was really revivification in a closed vessel. At each operation, there was an abundant sublimation of naphthalene, yet not a trace of it in the pipes, either on the works or under the streets. I suppose that the purifying material—and it would be the case with any other porous substance—had certain absorbent power for naphthalene, which enabled it to mechanically retain the latter until complete saturation took place. Revivification by the process I have indicated restored to the material all its powers of absorption; and by constantly repeating the operation, the naphthalene was prevented from going forward. The process was unfortunately expensive; and it was abandoned after a few years, when the works were enlarged.

In many works, no precaution is adopted to prevent freezing of the water in the tanks of gasholders. It is generally thought sufficient to break up the ice several times a day. The tanks suffer deterioration if they are of brick; the holders themselves are put out of shape; and the rigidity of the guide-framing is affected. These annoyances and inconveniences may be easily and cheaply got rid of by adopting steam heating, or by using a thermo-syphon. I will give as an example a telescopic gasholder of 3000 cubic metres capacity, in a metal tank constructed entirely above ground. The volume of water is 1700 cubic metres (375,000 gallons). The heating is effected by a thermo-syphon which cost 600 frs. During the winter of 1894-5, the heating necessitated the consumption of 500 kilos. of coke per diem. When the atmospheric temperature was down to 15° C. below zero, not an atom of ice was formed. The other holders, in brick tanks which had not been heated, caused all kinds of trouble.

The question of distribution is one of the most intricate we have to solve. Our object should be to obtain sufficient pressure over the whole system to ensure the proper working of the various appliances served, and at the same time to avoid excessive pressures, which result in increase of leakage. If there are great differences of level, each should be controlled separately by a special governor, if this arrangement does not necessitate a very extensive system of mains and services; or governors may be placed at the base of slopes leading to higher levels. One or more trunk mains should always come from the works, and terminate at central points, whence the distributing-pipes may start. This arrangement has long been recommended; but I fear it has not been duly appreciated, and its application is often neglected where it would have given the best results.

The question of leakage is one which should have serious attention. With regard to the frequently exaggerated complaints of the public, it is well not to accept responsibility without first ascertaining if the fault does not rest with others. The checking of leakage should begin with an exact measurement of the quantity of gas manufactured. Attention should be given to variations of temperature; and there should be proper supervision of consumers' meters. Due vigilance against fraud should be exercised, even though the company be accused, as sometimes they are, of inquisitorial conduct. Governors should be fitted to the public lamps, and be employed in all cases where the consumption is not checked by meters. It is important also to ascertain what gas is used within and outside the works for the company's own purposes; and the best plan is to have a meter for each service. These precautions are useful in helping a manager to arrive at the total quantity of gas lost by leakage in distribution. A perfect joint—one which will yield without deterioration to changes in the level of the pipes, variations of temperature, and so forth—has still to be found. The best appears to be the one made of india-rubber; but in the neighbourhood of the works it is affected by the light oils contained in the gas. Where it is employed, the use of benzene or similar products to clear pipes obstructed by naphthalene, must be avoided; as otherwise the india-rubber would melt and the joint be broken. Ordinary lead joints lack elasticity, and are affected by changes of temperature. Leakage resulting from bad jointing may be obviated to a great extent by the employment of careful main layers working under good supervision. A fresh cause of deterioration in mains is their proximity to electric conductors, especially those employed for tramway traction. This constitutes for gas managers a new enemy to be combated.

Suppliers of gas have been charged, more or less justly, with neglecting to make some effort to develop the consumption of gas. This reproach is not always well founded; and certainly during the past few years considerable sacrifices have been made to attain this object. The first thing to be done is to enable the consumer to have gas fittings and appliances at as small an expense to him as possible—making the connection with the main without charge, or at only a nominal one, and letting fittings on hire with easy terms of purchase. In some cases, the fittings become the property of the consumer when the gas burnt reaches a certain quantity. The special means selected to stimulate consumption will necessarily be governed by local requirements. A show-room furnished with the various kinds of appliances, and in charge of an intelligent attendant to demonstrate their utility and give general information to the inquirer, is an excellent medium of publicity; while cookery lectures have been followed by very satisfactory results. Periodical domiciliary inspections by competent officials would be productive of much good. At Bayonne, at the suggestion of the Directors of the Gas Company, the inspection of gas cooking-stoves has been entrusted to a lady. The idea may at first appear strange; but one can easily see that a properly trained lady would be able to give consumers much information respecting matters which come specially within her province. She would be able to show practically the best way of using gas-stoves; and, moreover, she would be in a position to give a few hints as to the necessity for cleanliness in connection with culinary operations. At any rate, at Bayonne satisfactory results have attended the introduction of this novel system.

We all know what trouble arises from the freezing of water in the consumers' meters. This was particularly noticeable last February. Alcohol is frequently employed to obviate the difficulty; but it is expensive and evaporates. Glycerine solutions have been recommended; but these, although harmless when first used, in time form a greasy substance which interferes with the working of the meter, and even eventually act upon certain metals. Solutions of chloride of calcium have been well spoken of; but, even when non-acid, there is diversity of opinion as to their harmless nature. It would be of great advantage to gas managers if there could be found an uncongealable liquid which could be used in meters without risk of interference with their working or detriment to their constituent parts.

And now a few words in conclusion. When constructing new works, or enlarging or altering those already erected, first prepare a general plan which, while satisfying present requirements, shall also provide for the future. Build large enough, but not too large; and let what you build be solid and durable in every part, in view of the rough use to which gas-works plant is sometimes put, and the long service it has to render. Outlay should only be incurred when it is absolutely indispensable, when it is likely to be productive, and when the capital sunk can be soon redeemed. We should look beyond our own works, and even our own country, to enable us not only to adopt what is good, but also to avoid what is bad. Experience is doubtless the best thing, provided it does not cost too much to acquire it. The great thing is to profit by that gained by others. Do not lay yourselves open to the charge of being mere routinists; but be prudent in the application of new processes. The knowledge of what has preceded us or surrounds us, not merely in our own industry but in the sciences which are allied to it, is indispensable to good management. By becoming more enlightened, we avoid regrets, disillusions, and loss of time and money. After we have

given to the management of our undertakings all the attention it demands of us, let us—and here I address more particularly the young—devote a portion of our time to study. The field of transformations and fruitful creations is unlimited. Each fresh discovery should become in its turn the starting-point for further progress. Notwithstanding all our knowledge, there are some very simple facts which lie close to us in our path, yet of which we are ignorant, simply because we have not learned to see them.

I have dwelt at some length upon matters of current practice. But you must not suppose that I ignore the necessity for the study of fresh questions. On the contrary, I consider they should occupy us, even though they may be still in the domain of theory. We live in times when these questions abound. I need not enumerate them. You know what they are; and you will give to them a portion of your attention.

A report was presented from the Committee on the subject of the papers submitted in competition for the Society's premiums. One of these, bearing the title of "The Chemical Purification of Illuminating Gas," was by MM. Delseaux and Renard; and the Committee considered it worthy of a premium of 750 frs. Another, on "Water Gas," by M. Effenterre, gained a premium of 500 frs. A paper by M. Derval, on "Gas Generators," was, with the author's consent, submitted as an ordinary communication. A paper by M. Châtaignier on "The Production of Incandescent Light by Means of Illuminating Gas," sent in last year to compete for one of the Society's premiums, gave rise to some severe criticism which prevented its acceptance as a competitive paper. The author, however, withdrew it from this category, and, after making certain corrections, sent it in as an ordinary contribution to the proceedings. The Committee were of opinion that he had been at considerable labour in preparing his paper; and, as it contained matter likely to give rise to useful discussion, they thought that he should be encouraged by the award of a prize of 250 frs.

As customary, prizes of 200 frs. were awarded to aged foremen or workmen for good conduct and long service. There were 23 recipients, whose ages ranged from 50 to 81 years; and their periods of service, from 32 to 53 years. Medals and diplomas were also bestowed by the Minister of Commerce and Industry (M. Alfred Libon) upon seven gas workers selected by the Society as being specially worthy of this distinction. They had served in gas-works for periods ranging from 34 to 42 years.

On the evening of the first day of the meeting, the usual banquet took place at the Hôtel Continental, under the presidency of M. de Lachomette. Among the guests were M. Alfred Picard, Commissioner-General for the Exhibition of 1900 (who was accompanied by several of his colleagues), MM. Troost, Laroche, Godot, and Bertrand, Directors, and a number of the officials of the Paris Gas Company, and several foreign members of the Society, among them being Mr. Corbet Woodall and M. Weil-Goetz.

We shall notice in subsequent issues the papers read at the meeting.

THE DETERMINATION OF WATER IN COMMERCIAL SAMPLES OF SULPHATE OF AMMONIA.

The following article on the above subject was contributed to a recent number of the *Chemical News* by Mr. JOHN HUGHES, F.I.C.:—

It is not generally usual to state the percentage of water present in commercial samples of sulphate of ammonia. Occasionally chemists are asked to do so, and also to specify the amount of acidity; and in such case the figures are given. But usually only the percentage of nitrogen equal to ammonia is reported. The writer thinks it would be desirable and useful that the percentage of water lost at 212° Fahr., and the acidity expressed as sulphuric acid (H_2SO_4), should always accompany the figures for nitrogen and ammonia on the certificate.

Sulphate of ammonia, when ground up in a mortar, rapidly loses moisture in a hot, dry atmosphere. Consequently, in order to make a correct report on the percentage of nitrogen contained in the sulphate of ammonia in its natural state as received, it becomes necessary to make two water determinations—one in the sample as turned out in its rough, damp state before grinding, and one in the finely-ground portion prepared for the purposes of analysis; the analytical results being afterwards calculated into the natural state as received, and reported accordingly.

The question of water really is a most important one, bearing in mind the commercial value of the material and the fact that every 1 per cent. of water lost represents an increase of 0·25 per cent. of ammonia. It is true that the introduction of centrifugal machines has largely reduced the proportions of water and acidity in the sulphate of ammonia as sent out; but there is still sufficient difference between the dampness respectively at the top and the bottom of the bags to make the sampling a matter of great importance.

The following twelve samples, representing one delivery of yellow sulphate of ammonia, were furnished to the writer by a large London manure firm; six bags being selected, and samples drawn respectively from the top and bottom of each. The proportions of water and acidity were then carefully determined as above suggested; a weak solution of litmus being employed as the indicator in titration for acidity:—

Top Samples.

	Water as Received.	Water as Analyzed	Water Lost During Preparation.	Free Acid Calculated as H_2SO_4.
1.	1·98	1·26	0·72	0·97
2.	1·81	1·42	0·39	0·63
3.	1·59	1·20	0·39	0·65
4.	0·87	0·48	0·39	0·81
5.	1·12	0·50	0·62	0·79
6.	1·32	0·72	0·60	1·03
Average	1·45	0·93	0·52	0·81

Bottom Samples.

	Water as Received.	Water as Analyzed.	Water Lost During Preparation.	Free Acid Calculated as H_2SO_4.
1.	2·62	1·64	0·98	1·24
2.	2·65	1·94	0·71	0·81
3.	2·53	1·76	0·77	0·80
4.	3·14	2·12	1·02	1·22
5.	1·97	1·24	0·73	0·71
6.	2·39	1·84	0·55	1·07
Average	2·55	1·76	0·79	0·97

It will be noticed that the differences are considerable; the top samples being much drier than the bottom ones. In No. 4, the difference was as much as 2·27 per cent.—representing 0·56 per cent. of ammonia; and the water lost during preparation amounted in some cases to upwards of 1 per cent., or equal to 0·25 per cent. of ammonia. Of course, this loss during preparation will vary with the degree of grinding, the time exposed, and the temperature and humidity of the atmosphere.

The following figures in seven other samples, each representing a separate delivery, and analyzed at a different time, will serve to indicate the variation that may be expected:—

Colour.	Water as Received.	Water as Analyzed.	Water Lost During Preparation.	Free Acid Calculated as H_2SO_4.
White	2·20	1·80	0·40	0·29
Yellow	1·94	1·50	0·44	0·31
Do.	2·31	2·06	0·25	0·15
Grey	2·96	2·74	0·22	0·38
White	1·70	1·10	0·60	0·15
Do.	1·90	1·40	0·50	0·23
Do.	1·89	1·32	0·57	0·25
Average	2·13	1·70	0·42	0·25

The amount of acidity is of importance, because, if not excessive—say, not more than 0·5 per cent.—the sulphate of ammonia can be safely shipped in double bags, instead of in the more expensive casks which were formerly used. If the certificate of the analyst contains information as to the percentage of water and acidity, in addition to the figures for nitrogen equal to ammonia, the identity of the sample with the bulk can be more readily established than when the figures for ammonia only are stated.

New Gas Examiner for Sheffield.—Mr. C. K. Baker, F.I.C., is to be recommended to the Sheffield Corporation by the General Purposes Committee for the appointment of Gas Examiner in the borough, which position has been resigned by Mr. Jonathan Wilkinson.

Drilling a Gas Well with an Electric Motor.—The Westinghouse Electric Company have commenced the drilling of a well for natural gas on land in front of their new works at East Pittsburg; and the novel experiment of using electricity for power is being made. An ordinary 25-horse power motor, such as is used in a traction car, will be placed in the engine-house instead of a steam-engine, and the electricity will be supplied from the works.

North British Association of Gas Managers.—The 34th annual general meeting of this Association is to be held in the Corn Exchange, Melrose, next Thursday, under the presidency of Mr. A. Wilson, of Dawsholm. We learn from the programme issued by the Secretary (Mr. R. S. Carlow) that, in addition to the Inaugural Address, there will be four papers; and the contents of the "Question-Box" may possibly furnish a few technical items. Mr. W. Young, of Peebles, will contribute some "Notes on the Chemical Constitution of Illuminating Gas in Relation to Its Illuminating Value, and on Some of the Physico-Chemical Conditions which Influence the Luminosity of Gas-Flames;" Mr. J. Napier Myers, of Saltcoats, will put in "A Plea for Standardizing Meter Unions;" Mr. D. Vass, of Portobello, will deal with the subject of "The Heating Value of Coal Gas;" and Mr. A. Waddell, of Broughty Ferry, will consider the question of "The Working of Shale and Splint Coal *versus* Oil and Splint Coal." After the business, the members will dine together in the George and Abbotsford Hotel. As the meeting is to be held in a district so full of historical associations, it is only what might be expected that arrangements would be made for the members and their lady friends to visit Abbotsford. This will be done on Friday morning. On the return to Melrose, luncheon will be served, and afterwards an opportunity will be afforded of visiting the famous Abbey.

REGISTER OF PATENTS.

Manufacturing Gas.—Mayer, F., of Baltimore, U.S.A. No. 13,758; July 17, 1894.

The claims put forward for this invention embrace twin generators, having two pipes or tubes extending through the brickwork thereof. In communication with them are blast-pipes (small pipes connecting them with the generators) and a gas-pipe leading from each pipe or tube to a hydraulic main. A system of steam-pipes is provided, whereby steam may be introduced into the pipes or tubes alternately; vertically moving the dip-valves in the hydraulic main. Suitable mechanism connects the dip-valves, whereby on the elevation of one valve the other is depressed or lowered. There is an indicator or a pointer, having a movement in common with the dip-valves, to indicate their positions in the hydraulic main, and also to indicate which controlling steam-valve is to be opened at certain stages of the gas-making operation. A gas-pipe leads from the bottom of each generator (and underneath the fuel therein) to the hydraulic main, and through the water in the said main to a point somewhat above the water-level. In this are placed dip-valves, which at all times cover the gas-pipes, and are sealed by the water. Mechanism is provided, whereby the dip-valves are moved together—vertically, but in opposite directions. In this way the relative resistance offered by the two valves to the passage of gas from the two generators may be changed, or the resistance equalized.

The general arrangement of the plant is not described in the specification apart from the drawings (eight sheets) which accompany same.

Retorts for the Manufacture of Gas from Coal, Oil, Tar, &c.—Scott, A., and M'Lean, P., of Galashiels. No. 13,841; July 18, 1894.

In the case of cast iron or other metal retorts, the patentees remark, it is found that—either owing to unequal heating, or to expansion and contraction due to the comparatively cold oil, tar, or other gas-producing material, coming into contact with the heated surface, or from other causes—the retort is very liable to burn out or crack on the underside (generally near the inlet end), thus allowing the gas and gas-producing material to leak through in quantity, and speedily render the retort useless. The purpose of the present invention is to preserve the retort from so burning out or cracking, by introducing inside the retort a liner made of malleable iron, steel, or other material, extending either the full length of the retort or such distance from the inlet end as, found necessary. This acts as a shield, and prevents the oil, tar, &c., from immediately impinging on the heated retort; and thus allows the latter to remain at a more uniform temperature throughout. At the same time, if there be any crack in the bottom of the retort, it prevents leakage of the gas or gas-producing material, as the interstices between the retort and the liner are quickly filled with carbon. Preferably the liner should be about ⅛ inch thick, and should be of similar form to the inside of the retort.

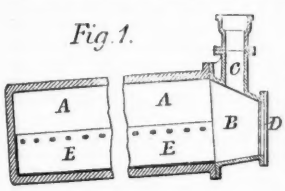


Fig. 1.

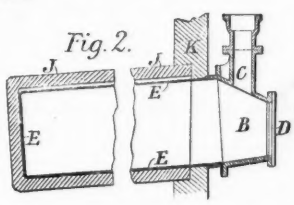


Fig. 2.

Fig. 1 shows a sectional elevation of a cast-metal retort A. Bolted to it is a mouthpiece B, having a gas-escape branch C, and door D. Inside this is the liner E, full length inside the retort, and but half the diameter. It is fixed with set-screws, tapped into the side of the retort. The holes throughout the liner are made oblong, to allow of expansion. The liner in this case has a closed or solid end. Another method of fixing the liner consists of angle or T-shaped half rings, bolted to the sides of the liner, and pressing hard against the upper side of the retort, thus keeping it in place. Another method is by casting snugs on each side of the retort, into which the upper edge of the liner fits. Or, again, if it is desired to have liners filling the inside of the retort, these can be dropped in loosely, or cast with the retort, or expanded into place.

Fire-clay retorts are at present unsuitable for producing gas from oil, tar, or any other liquid or semi-liquid gas-producing material; as when heated, the material is absorbed by, or percolates through, the pores of the fire-clay, and is lost. In this case, the patentees propose to insert a malleable iron or steel liner, or inner retort, preferably ⅛ inch thick, and of circular shape, nearly filling the space inside the retort, but leaving sufficient room for expansion. This liner or inner retort has one closed end—welded, riveted, or otherwise securely fixed and made tight. The other end projects out through the open end of the fire-clay retort, and has a flange to which the mouthpiece can be bolted. The use of the outer fire-clay retort is to transmit the heat to, and yet protect the inner liner or retort from the furnace gases or flame.

Fig. 2 is a longitudinal section of such an arrangement. J is the retort; E, the malleable iron or steel liner or inner retort; B, the mouthpiece bolted to it; and K, the front supporting wall on the frame of the retort-bench.

Protecting Metal Surfaces, or Surfaces Containing Metals, against Corrosion by Water or other Fluids.—Paskin, J. A., and Ackroyd W., of Halifax. No. 16,886; Sept. 5, 1894.

The object of this invention is to keep water from contact with lead or other metal piping by lining or coating the inside of the pipes with gutta-percha, so that the water may not become contaminated, also protecting such metal pipes or surfaces against corrosion. The gutta-percha is deposited either in solution, or by coating the interior of the pipes with the melted gutta-percha by mechanical means.

Igniting Gas-Burners.—Duke, J. F., of Newington, Surrey. No. 969; Jan. 15, 1895.

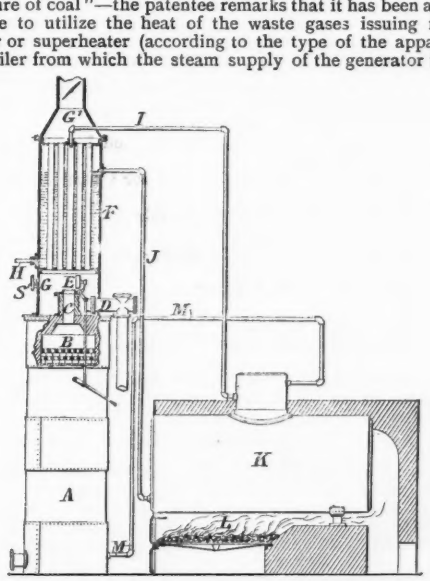
The utility of this invention was pointed out and illustrated in the JOURNAL for June 25 last (p. 1378). In explanation of his invention, the patentee says: It is well known that platinum black or spongy platinum will occlude a large quantity of oxygen from the air; and that, if a stream of hydrogen be directed upon the platinum, the chemical combination of the two gases takes place with sufficient energy to raise the temperature of the platinum. Attempts have already been made to take advantage of this property of platinum, by applying it to the automatic ignition of gas. In these attempts, the gas issuing from an ordinary burner has been caused to blow upon the platinum contained in a receptacle, so as to warm the platinum sufficiently to render incandescent a fine wire of platinum carried from the platinum in the receptacle to a position where it comes into contact with the gas as it issues from the burner; and this wire, on becoming incandescent, ignites the gas. None of these attempts has proved a practical success; but the patentee claims to have found by experiment that metallic platinum in the very finely-divided form known as platinum black or platinum mohr, is the only form of platinum that will cause the combination of the coal gas with its occluded oxygen, at the ordinary temperature, with sufficient energy to produce the heat requisite to render incandescent a length of platinum wire when a current of cold carburetted hydrogen or ordinary illuminating gas plays upon it. He has always found that after a time the atoms of the platinum black coalesce, because the heat communicated to them by the flame and by their own act of occlusion, combined with the free access of the oxygen in the air, tend to decarbonize or fuse the platinum black. When the particles have more or less coalesced, they are not in a finely enough divided condition to bring about the combination of the coal gas with the oxygen of the air, at the ordinary temperature, with sufficient rapidity to render the wire incandescent when a stream of cold carburetted hydrogen is passed over or along it. His invention therefore consists in the employment of a block of porous material, in the pores of which platinum black is contained, so that the particles of platinum black are effectually prevented from coalescing. The invention also comprises the method of getting atoms of platinum black into the pores of the block.

For the purpose of the invention, the patentee takes a solution of a platinum salt soluble in water, and immerses therein a block of suitable porous material, so that it may absorb some of the solution. Meerschaum is eminently adapted for the purpose. He subjects the material containing the platinum salt in its pores to the action of a substance which, by causing a chemical reaction, will reduce the platinum salt to the metallic state without having any chemical action on the material of which the block is composed; the metallic platinum remaining in the pores in so finely divided a form as to constitute platinum black.

In carrying out the invention, the patentee preferably uses a solution of bi-chloride of platinum—5 cubic centimetres of water to 1 oz. of the platinum bi-chloride, or a weaker solution may be used, with repeated immersions and drying. After the meerschaum has absorbed into its pores as much of it as it can take up, he subjects the meerschaum to the action of carburetted hydrogen, taking care to exclude the atmospheric air; the carburetted hydrogen being heated to a sufficient temperature (say, about 150° C.) to cause its hydrogen to combine with the chlorine of the platinum bi-chloride, and form hydrochloric acid gas. The platinum is thus reduced within the pores of the meerschaum to the metallic state known as platinum black or platinum mohr.

Manufacture of Water Gas.—Glasgow, A. G., of Victoria Street, Westminster. No. 1487; Jan. 22, 1895.

Alluding to his invention—which has for its object "to provide a supply of steam for the generator or generators, for the blower engine or engines, and for the other usual purpose, with a minimum expenditure of coal"—the patentee remarks that it has been attempted heretofore to utilize the heat of the waste gases issuing from the generator or superheater (according to the type of the apparatus) to heat a boiler from which the steam supply of the generator is drawn.



But as this source of heat is irregular and uncontrollable—there being no relation between the supply and the demand—this attempt has met with indifferent success in the manufacture of uncarburetted water gas, and has, it is said, been entirely abandoned in the case of carburetted water gas. Generally speaking, the invention consists in combining with the generator a boiler, the tubes of which form part of the

conduit for escaping gases, and also a boiler heated by means independent of the escaping gases, uniting the steam spaces of the boilers, and also, preferably, the water spaces.

A is the water-gas generator, with air-blast connection at foot. M is the steam-supply pipe. B is a fixing chamber, superimposed on the generator. C is the flue leading from the chamber B, connecting with the gas-flue D, and delivering (when the valve E is open) into the blast-gas conduit G G^1. S is the inlet for the air necessary to complete the combustion of the escaping blast-gases, provided the flue G be practically closed as shown. In case the space G be left freely open to the atmosphere, the indraught of air to complete the combustion of the escaping blast-gases is regulated by the damper shown. E is the valve by which the course of the gases is governed. F is a boiler set in the blast-gases conduit G G^1, the upper and lower parts of which connect through the boiler-flues. H is the feed-water supply-pipe; I, a steam-pipe leading from the steam space of the boiler F; and J, a water-pipe leading from the water-level of the boiler F to a boiler K, with the steam space of which the pipe I connects, as shown. The boiler K is independently heated by a furnace L; and, preferably from it, leads the steam-supply pipe M. Obviously the steam pressure in the two boilers, F and K, is always the same, as they are connected by the pipe I; and the boiler, heated by means independent of the gases escaping from the gas-generator, can be so run as to obtain the full benefit of all the waste heat of the gases passing through the boiler F, while at the same time its own independent furnace ensures a heat supply sufficient at all times to maintain the necessary steam for use in the generators, blower-engines, and for the other usual purposes.

APPLICATIONS FOR LETTERS PATENT.

12,685.—Stevens, J. H., and Tourtel, J. M., "Gas or other measuring or delivering mechanism to be set in operation by presence of a coin or coins." July 1.

12,702.—Zerbe, J. S., "Using hydrocarbon oils and gases for fuel purposes." July 1.

12,744.—Clarke, A., "Gas heating apparatus." July 2.

12,777.—Arnotte, F., "Gas, oil, and other stoves." July 2.

12,848.—Brockhues, B., "Lighter for lanterns with incandescent gas-light." July 3.

12,854.—Potter, W. G., "Bunsen burners for incandescent gas lighting, and protecting mantles." July 3.

12,916.—Camelinat, E. G., "Heating and illuminating lamps." July 4.

13,005.—Monks, J., and Bush, R. N., "Heating drying-cylinders by gas in place of steam." July 5.

13,019.—Newton, H. E., "Gas plant." A communication from R. N. Oakman, jun. July 5.

13,047.—Compagnon, A. Le, and Guibert, J., "Gas or petroleum motors." July 5.

13,048.—Taylor, G., "Loading and discharging trams, railway waggons, and coal vessels, and transferring coal and other substances from one place or level to another." July 6.

13,080.—Day, E. A., "Pipe-joints." July 6.

13,083.—Jones, A., "Pipe-joints." July 6.

13,111.—Crocker, S. H., "Manufacture of incandescent tissue for lamps." July 6.

13,197.—Priestley, G. F., and Bancroft, W. S., "Regenerative furnaces and fans for inducing draught." July 9.

13,200.—Cowan, W. and W. H., "Prepayment gas-meters." July 9.

13,221.—Bromhead, S. S., "Central-draught lamps." A communication from C. S. Upton. July 9.

13,230.—Mayer, F., "Manufacture of oil gas." July 9.

13,236.—The "Cannon" Hollow-Ware Company, Ltd., and Ward, T., "Conduits or tubes of gas-burners through which mixed gas and air pass to the outlets at which they are burnt." July 9.

13,256.—Leeman, J., "Cartridges for increasing the illuminating power of petroleum and like hydrocarbons." July 9.

13,259.—Bergier, L., "Gas-burners." July 9.

13,313.—Gunn, L., "Gas or other hydrocarbon engines." July 10.

13,357.—Barwise, S., "Preventing the bursting of lead or other pipes or tubes through the action of frost." July 11.

13,403.—Cundall, J. S., R. D., W. D., and H. C., "Gas and oil motor engines." July 12.

13,446.—Cutler, S., "Controlling gear for steam supply to water-gas generators." July 12.

13,456.—Raydt, W., "Obtaining carbonic acid from gas mixtures in the dry way." July 12.

13,467.—Oehlmann, E. H. C., "Burners for incandescent lighting." July 12.

13,497.—Rochford, T. H., "Water-taps for the prevention of waste of water." July 13.

13,510.—Green, J., "Obtaining hydrogen gas from water, and also obtaining carburetted hydrogen and other combinations of hydrogen." July 13.

13,524.—Kershaw, A., "Gas-pressure regulators." July 13.

15,529.—Janse, B., and Witte, J. de, "Gas heater for a carriage." July 13.

The Sale of Coke in London.—For carrying out the provisions of the Weights and Measures Act in London, the London County Council employ a staff of 81 inspectors and their assistants; and the result of their labours last year is recorded in the lately issued report of the Public Control Department of the Council. Reference is made therein to the sale of coke. Under the provisions of an old Act, coke has to be sold by weight; but, having regard to the fact that it is capable of absorbing considerable moisture, this requirement, in the interests of the purchaser, has not been enforced. The coal officers of the Council have found, however, that small dealers and hawkers utilize as measures fruit and margarine baskets, which are always of less capacity than the measures they are intended to represent; and the use of proper measures stamped by an inspector is now insisted upon.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Labour Question.

Sir,—The constant references to the labour question in the Journal are evidence of its prominence in the thoughts of gas managers; and they invite further discussion on the subject.

In a letter which appeared on the 28th of May last, Mr. Goodson, of Heckmondwike, struck a key-note both by the expression of broad and enlightened views and by his statement "that the subject has now reached a most acute stage, and is a stern and grim reality." This accounts for the interest it creates, and should impel to action of some kind.

In the presidential address at the meeting of The Gas Institute in Edinburgh on the 11th of June, my friend Mr. Mitchell went a little out of his way to condemn my proposal for workmen directors. Of this, I certainly do not complain; and I would only remark that those who condemn an attempt to meet a difficulty should be prepared to suggest a better plan, or prove either that the difficulty does not exist, or will not be met by the plan proposed. Failing this, their objections have no weight with those who are earnestly desirous of doing what they can in the direction of improvement.

On the 9th inst. you published Mr. M'Crae's paper and the discussion thereon. The paper does great credit to the writer's kindness of heart. But it certainly does not go to the root of the matter; for it is little more than an amplification of his statement that the "disputes, difficulties, and disturbances" that have taken place in gas-works, in his opinion, "might have been averted by a conciliatory spirit all round," which was disputed by some of the subsequent speakers.

Now, "conciliation" is a very smooth and taking word; but it represents weakness rather than strength. It is very commonly one-sided, and is useless where a real difference exists, because it means that, for the sake of peace, both sides should give up part of their rights. This is not a solid foundation for lasting peace; for human nature vividly remembers what has been given up, but generally forgets the equivalent that was received. What is wanted, in the first and supreme place, between employer and employed, is just dealing; and it is of scarcely less importance that both sides, and especially the employed, should know that even-handed justice prevails.

The earnest and spirited discussion on Mr. M'Crae's paper, however, was of greater interest than the paper itself, not merely on account of what was said, but also for the strong feeling or motive power that was evidently behind, and prompted the speeches. I have much sympathy with the remarks of Mr. William Carr in reference to the displacement of labour by machinery. *If the men would act fairly and honourably*, as they generally did before the advent of the Gas Workers' Union, and often do still where the Union has lost its power, then surely it is neither right nor wise to introduce machinery simply to displace them. I must say, in Mr. Carr's defence—though he is about the last man to need a defender—that his opponents ignored his repeated statements that it "was apart from any consideration of saving of cost," and that they were told "that it would be better in every respect—apart from any economical considerations, and however amicable the relations between the workers and the employers might be—to do with 20 men instead of 200." No man who knows Mr. Carr can suppose he objects to machinery where it cheapens production—in fact, he says as much in this week's Journal. It is equally certain that the preference of other speakers for machinery was due more to a desire to be independent of labour, for which, no doubt, they have sufficient reason. Doubts and fears and difficulties, present and future, were probably in their minds; and, in despair of finding means for placing employers and employed on a satisfactory footing, the leading idea was to dispense with labour to the utmost possible extent. This, however, will be no remedy. A number of stokers may be displaced; but other workmen will probably increase. Consequently, the idea of overcoming the labour difficulty in this way cannot but be limited in its effect; and those who are trusting to it are leaning on a broken reed.

The present, it is true, is a time of comparative peace, with sufficient mutterings here and there to indicate that, on the return of suitable conditions, there will be another outbreak of the storm. This, therefore, is the time to prepare to meet it, or rather to take such steps as will quell it at its source, or, better still, divert and unite its forces—the forces of labour—to those of capital, for their mutual advantage and the general good of the country. I believe this is possible and practicable. But, as you have so often forcibly said, the employers must take the initiative. Some of them are spoken of as "Captains of Industry," which is meaningless unless they take their proper positions as the trusted leaders of both companies of the industrial host.

I have no desire, either directly or indirectly, to reopen just now the discussion on the knotty point of workmen directors; but the main object of this letter is to invite suggestions to meet the difficulty. Some probably believe that it will pass away without effort on their part, or, at any rate, that no effort of theirs will be of any avail. But what real ground is there for hope that it will thus disappear while strenuous efforts continue to be made all over the country that tend to deepen and intensify it? The extremists on the other side have a policy—adopted by an overwhelming majority at the Trades Union Congress at Norwich in 1894. At the instance of their Parliamentary Committee, a conference took place at Manchester on the 10th inst. of 130 delegates, professedly representing a million trade unionists, to formulate the conditions on which their support would be given to parliamentary candidates. In those conditions, they have included the socialistic resolution of the Norwich Congress "to nationalize the land and the whole of the means of production, distribution, and exchange." Of course, no man in his senses for a moment believes in the possibility of such an insane proposal; but, for all that, it is capable of doing much mischief by creating and maintaining a feeling of discontent, and raising vain hopes in the minds of workmen—thus diverting their attention from practical measures for the bettering of their condition.

Seeing there is no probability that the difficulty will pass away of itself, whatever happens can only be the result of individual effort. It therefore behoves all who are interested in its removal to do their part. None can say that the JOURNAL has not done its part well; and it remains for directors and managers of gas-works to do theirs. Will not some of them begin by giving their views on the question, by proposing a remedy or by suggesting the lines on which to work? The time is propitious. The rout of the so-called Labour leaders and semi-Socialists and their friends in the elections will discredit them with their followers—in fact, their one-time followers have already lost faith in them, as is proved by the votes of working-class constituencies; and now is the opportunity for the employers to take their proper position as leaders in the ranks of industry. It is certain there are many gas directors and managers who are anxiously seeking, and are sincerely desirous of finding, some satisfactory solution. The circumstances of the gas industry are most favourable; and all who will help, by discussion or otherwise, in the good work, will certainly have their reward.

GEORGE LIVESEY.

Reigate, July 18, 1895.

The Discussion on Mr. M'Crae's Gas Institute Paper.

SIR,—I have not the least intention of being drawn into a correspondence on the subject of my Gas Institute paper of June, 1894; but the further reference thereto by Mr. William Carr, in your correspondence columns, seems to call for some slight notice.

Mr. Carr was present at the reading of my paper, and spoke to it. Its "inhumanity" did not then seem to have occurred to him. I cannot understand why, after so long an interval, he should have come to the discussion of Mr. M'Crae's contribution to the late meeting with one very innocent paragraph from that paper "briefed" out, on which to found his most unexpected and uncalled-for attack.

It seems that everyone mistook the purport of Mr. Carr's observations; though I cannot think this was from the cause he suggests. At any rate, there is no "hoarseness" in his letter, which nevertheless conveys to me exactly the same ideas as did his remarks in Edinburgh. The only points I care to refer to are those in which I am directly accused of introducing carburetted water-gas plant for the simple pleasure of giving the men "one back," and, later on, when it is assumed that I am one of those who have "taken refuge behind an unprofitable machine" rather than keep "in sympathy and in touch" with my men. Neither of these assumptions is true. As the summing up of the whole matter, I claimed that I had been able to produce 21-candle gas by the new process at less cost than 17-candle coal and cannel gas, which should afford sufficient justification for the adoption of the system.

Further, when Mr. Carr was wading through my paper in search of the delinquent paragraph—which, by the way, occupies but eight lines out of nearly nineteen pages—it must have occurred to him that there were several reasons advanced in favour of the use of carburetted water gas other than that selected for his animadversion. I need not repeat them, but may say that I ventured to claim a dozen distinct advantages, of which the saving in labour came last.

I only wish to add that, if the substitution of 24 men for 340 men, and the production of 21-candle gas at less cost than was heretofore incurred for 17-candle gas, is not good enough for a man who is "in favour of real labour-saving appliances, and economy of production in every form," he must be very hard to please, and is very likely to be misunderstood. It seems to me that, in the adoption of a method offering such enormous advantages, we have merely followed, to a modified extent, the lead of Mr. Carr, who "never allowed any consideration for the men to stand in the way of those things." What an inhuman sentiment!

JAMES STELFOX.

Belfast, July 17, 1895.

Mr. Irwin's Paper at the Society of Chemical Industry.

SIR,—In your issue of this week, you reproduce a paper read by me before the Manchester Section of the Society of Chemical Industry in May last. Unfortunately, owing to absence from home, I was unable to correct the proofs of the paper before going to press; and hence there are a few errors which I would prefer to have been rectified. The chief one is in the impression given of a photograph of a disillumined gas-flame, which does not show at all the non-luminous band referred to in my paper, and which I consider of extreme interest in connection with the general subject of flame luminosity. Photographing such a slightly luminous body as a disillumined gas-flame is not an easy matter; the lengthy exposure necessary, and the flickering of the flame, being apt to obscure any but the general features. You will see, however, by the print enclosed, that a distinct non-luminous band is visible.*

A question was asked by one gentleman concerning the effect of naphthenes as enrichers. You, I see, have printed it (as well as in my reply) "naphthalenes," which, of course, is incorrect.

While I am writing, I should like to refer to Mr. Stenhouse's paper in the same issue. In it he shows that petroleum spirit is not so good an enricher as carburine. I have found, on the contrary, that (putting on one side the question of deposition in the pipes) the higher the boiling-point of the paraffin series of hydrocarbons, the greater is their enriching value. This is only what one could expect from the constitution of the various members of that series. One of the points, however, which I tried to bring out in my paper was that the advantage of using the Argand burner over the union jet was much greater in the case of hydrocarbons containing high percentages of hydrogen over those, such as benzene, containing a lower percentage of hydrogen. The difference, then, between the enriching value of the lower and higher fractions of petroleum spirit would not be so great in Mr. Stenhouse's experiments with the Argand burner as in mine with the union jet; still I think there should have been a slight advantage of ordinary spirit over carburine, as I suppose the latter to be merely the lighter fractions from the former.

WILFRED IRWIN.

Manchester, July 20, 1895.

* The print referred to, which we had not time to reproduce, clearly shows the non-luminous band.—ED. J.G.L.

SIR,—In the course of the discussion on the paper recently read by Mr. W. Irwin before the Manchester Section of the Society of Chemical Industry, Mr. Ball indicated with sufficient clearness the points in the methods of photometry and "carburation" employed by the author of the paper in his experiments that would not appeal to the practical gas manager. It is already generally known that, by such a method of photometry as would make Manchester gas to be of 12 6 candles, almost any case could be proved. What would the friends of any particular enriching material exclaim if someone were to test the unenriched gas to its fullest advantage and the enriched gas to manifest disadvantage, and show, as would be quite easy, that the material in question had a negative effect?

Mr. Irwin, in his paper, says that, in a recent paper, I laid great stress upon a relation between the total effective carbon vapour in any gas and its illuminating power; and he calls my attention to the case of naphthalene and hydrogen. The simple relation I pointed out as existing in the case of coal, cannel, oil gas, and the gas in the flame of a petroleum lamp was not assumed for *any* gas. It was specially pointed out that the case of hydrocarbons alone or in simple mixture was quite different, and was not to be confounded with their behaviour in complicated mixtures, such as the commercial illuminating gases with which we are acquainted, and the cases of which were cited.

It would be an exceedingly simple matter if the illuminating power (intrinsic luminosity) of each hydrocarbon could be determined by an arbitrary method at the free will of the investigator, and then for all the world to be able to say such and such illuminating gas contains so much per cent. of hydrocarbon A at so many candles, so much per cent. of hydrocarbon B at so many candles, and so on through the whole of the constituents of the illuminating gas in question, and then to assert that the total is so many candles, and that that is its illuminating power. This view, which I call the additive view, it was one of the objects of my paper to controvert. The argument was that such illuminating gases as we deal with in practice contain a variety of hydrocarbons, some of high and some of low carbon precipitating power; and the most that those of high precipitating power can do *in the burner that has to be employed for the mixture* would be to fill up the gaps left by those of low carbon precipitating power.

Mr. Irwin has observed the same phenomenon, and has arrived at a somewhat similar observation, which, however, he explains differently. He explains it as "overlapping" (*vide* where he says: "You cannot get the full value of both the olefines and the benzene when burnt in any proportion together").

The argument drawn from the case of Paris gas, and its comparison with Manchester gas, will not have any weight with practical men, unless some reason can be suggested why such gas should owe its illuminating power more entirely to benzene vapour than do the gases of other places. Is there anything in the coal employed and its method of treatment that suggests that this should always be the case in Paris? The argument would have more weight also if it could be shown that Berthelot had tested Manchester gas by the same method of analysis, and had found the Paris gas richer in benzene vapour, and if the comparative analysis had extended over some period of time.

I do not see how the case of a mixture of naphthalene and hydrogen affects the arguments of those who assert that by adding hydrocarbons to gas its calorific value is thereby increased. Has not the naphthalene a higher calorific value than the hydrogen displaced?

The experiments by which Mr. Irwin shows that 20-candle gas, by being washed with its own bulk of water, is reduced to 2 candles, is interesting; but I would ask whether the quantity of washed gas was sufficient to enable him to determine its candle power. Half a bottleful appears but a small quantity for such a purpose.

LEWIS T. WRIGHT.

1, *Victoria Street, S.W., July* 20, 1895.

Sloping Retorts at Brentford.

SIR,—Kindly allow me to repeat, for the benefit of Mr. Husband, the following paragraph in my letter of the 2nd inst.: "Mr. T. Banbury Ball, of Rochdale, erected and worked the first installation, consisting of five beds of seven through retorts, in 1890." It will be seen that I here refer to the *straight through* inclined retort as now worked, and not the old Coze pattern with the cast-iron bent mouthpiece, which was a failure. The only single setting working at that time was the experimental one at the Southall Gas-Works.

Mr. Husband also says that "no improvements have been made since the first installation at Brentford." I have been always given to understand that the alterations that were made to the inclineds in No. 1 House at this works—viz., the change from seven retorts to six larger retorts in a bed, together with the alterations in the furnaces, have vastly improved the heating arrangements; and that it was upon this successful basis that No. 2 House was built.

I trust that this explanation will be clear to those who are conversant with this system.

MAURICE GRAHAM.

July 18, 1895.

Distributing Experts.

SIR,—In the JOURNAL for the 2nd inst., appeared an article headed "*Pro Bono Publico*," on the wisdom of having one or more practical gas-fitters, of good address, and fair scientific knowledge of the principles of lighting and heating by gas. Well, Mr. Foulis, Engineer-in-Chief to the Glasgow Gas Trust, has always encouraged the growth of such a class of distributing experts as is advocated. His outdoor foremen, besides superintending all new supplies and alterations on old ones, advise the public on all matters relating to economical lighting, heating, and cooking by gas, also gas motors. If it were necessary, numerous instances could be cited of the value of such advice, and the public appreciation of the same.

It is not to be expected that architects, speculating builders, and ordinary gas-fitters—much less the general public—can know what experts should know relating to the sizes of pipes, and the best way to take them; the most suitable burners, their position and number. And when we consider the late rapid developments in the field of heating, cooking, and motive power, all with coal gas, the need of

advice is still more felt. Particularly is this the case with respect to probable cost of fitting up, the after effectiveness of the appliance, the removal of the fumes, &c.

It is almost the daily experience of such men to be asked, even by architects and master plumbers, to enlarge services or meters, or both, in order to overcome defects located in the interior of the building, arising from too small pipes, old burners or unsuitable ones, or improperly adjusted burners, or something which experienced "Inspectors-in-General" (the title suggested in the article referred to) would soon detect.

Undoubtedly much of the increase in the consumption of gas, in spite of its powerful rivals, oil and electricity, and especially the great strides in heating, cooking, and motive power which have taken place here in Glasgow, is due to the efforts of Mr. Foulis's trained staff of experts, and the liberality of his Committee in granting supplies of gas on easy terms, and hiring out stoves on equally easy conditions—to the furtherance of which Mr. Foulis gives his powerful aid.

LIGHT AND HEAT.

Glasgow, July 18, 1895.

Professor Lewes on Gas-Stoves, &c.

SIR,—Professor Lewes, in his paper on "The Combustion of Coal Gas for Fuel Purposes," seems to convey that British manufacturers are behind their Foreign competitors in regard to the adoption of the regenerator principle as applied to gas-stoves. Our answer to that is that we have not allowed the principle to lie dormant. For many years, we have made and sold a "Regenerator" heating stove; but it was not tested by Professor Lewes against the German regenerator stove he refers to. The fact is, Professor Lewes made a comparative test of stoves constructed on totally different principles. Practical men do not need to be told that a competitive test between a slow-combustion coal-stove and an open coal-fire would be of no practical value; for the English public will have the open fire, with its cheerful glow and blazing fuel, in spite of the taste for closed stoves of our Continental neighbours. As it is with coal-fires, so it is with gas-fires. Englishmen want a glowing fuel fire, and are willing to pay for the luxury. There is nothing easier than to make an efficient gas-stove on regenerator principles (and such are made); but the public demand—as gas engineers know—is for fuel-fires; and manufacturers have to follow the public taste in such matters.

R. & A. MAIN.

Glasgow, July 17, 1895.

The Water Supply of Leicester.—The Water Committee of the Leicester Corporation may be congratulated upon the healthy position of the water supply of the borough, compared with this period of last year. They had on Monday last week 632¼ million gallons in their reservoirs, which have a total capacity of 889 million gallons. Therefore, notwithstanding the dry weather, there is a deficiency of only 256 million gallons, as against 667 million gallons on the corresponding date last year.

Cheshire Alkali and Salt Company, Limited.—A Company has been registered under this title with a capital of £85,000, divided into 10,000 "A" preference, 17,000 "B" ordinary, and 7000 "C" deferred shares of £2 10s. each respectively, to acquire the business, undertaking, and assets of the Cheshire Alkali Company, Limited, now in liquidation, or such of them as the Board shall think fit, in accordance with a scheme of arrangement sanctioned by an order of Court dated Feb. 4, 1895, and generally to carry on the businesses of chemical manufacturers, salt masters, distillers, dyers, printers, gas makers, coke manufacturers, miners, metallurgists, shipowners, and chemical engineers, &c., in all or any of their respective branches.

Coal Contracts at Oldham.—The subject of the coal supply for the Oldham Gas-Works has lately, as our readers are aware, been the subject of some discussion in the Town Council; and the matter has been investigated by a Sub-Committee (see *ante*, p. 91). It came up again on the presentation of the minutes at the meeting of the Committee on the 10th inst., when the accuracy of the statement which, as he said, "purported to be the report of the Sub-Committee," was questioned by Mr. Shaw. He remarked that it was there stated that there was an apparent advantage in favour of the Higginshaw works of 11d. per ton, compared with Hollinwood; but he did not remember 11d. having been mentioned. Mr. Harrop said that this statement was certainly incorrect. The Town Clerk asked Mr. Shaw if he contended that the minutes of the special meeting at which the report was discussed did not present a true record of what took place. Mr. Shaw said he did. Alderman Hall thought the matter should be dealt with by the Sub-Committee. Mr. Harrop said the figures at which the Sub-Committee arrived showed an advantage in favour of Hollinwood over Higginshaw of 1d. per ton for three months, but an advantage to Higginshaw over Hollinwood of 1¾d. per ton for twelve months. They took into consideration candle power and everything else before they arrived at that result. He moved that the minutes be corrected in accordance with the figures given. After a remonstrance from the Mayor (Mr. R. Whittaker) at the time of the Committee being wasted, the minutes were passed with the exception of the sentence referring to the 11d.; the Chairman (Alderman Smith) remarking that the question could be raised again if necessary. The Assistant Town Clerk then read a letter from the Chamber Colliery Company, Limited, in reply to one from the Committee inviting an amended tender for coal, in which the Company declined to quote a lower price, but offered to pay for an independent analysis of their coal, and to accept what that analysis decided to be a fair market price. The letter had previously been before the Committee, and a gentleman had been selected to make the analysis. In reply to a question, the Gas Superintendent (Mr. Andrew) said no coal had been sent to the gentleman named, as he had not received any intimation of his appointment. After some remarks, Mr. Johnson moved that the resolution respecting the private analysis be rescinded. Mr. Harrop seconded the motion—to show, he said, the confidence he had in their Manager (Mr. Chadwick); and the motion was carried. Subsequently, Mr. Chadwick gave particulars of tests of coals; and eventually the contract for 20,000 tons, at 8s. 9d. per ton, was placed with the above-named Company.

LEGAL INTELLIGENCE.

JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Wednesday, July 10.

(*Before Lords* WATSON, HOBHOUSE, MACNAGHTEN, *and* DAVEY, *and Sir* R. COUCH.)

The Bower-Barff Patent.

This was a petition by the Bower-Barff Rustless Iron Company, Limited, for the prolongation of letters patent granted to Frederick Settle Barff (since deceased), George Bower, and Anthony Spencer Bower, for "improvements in effecting the protection of iron and steel surfaces, and in the furnaces employed therein," dated July 28, 1881 (No. 3304).

Mr. MOULTON, Q.C., and Mr. LAWSON appeared for the petitioners; Mr. SUTTON represented the Crown.

The invention for which the letters patent were granted related to certain processes by which iron and steel can be protected from rust, and especially to the employment of a furnace constructed and arranged in a particular manner for carrying out the processes. It was stated that the invention was of great utility, and very beneficial to the public. The patent was subsequently purchased by the Bower-Barff Rustless Iron Company, Limited. The inventors took out various foreign and colonial patents in respect of the invention; but the petitioners had never had any transactions relating to them. It was contended that, owing to the difficulty experienced in inducing people to appreciate the advantages of the invention, they had incurred considerable expense, and they had lost large sums of money; and it was only now, when the patent was about to expire, that the real value of the invention was being understood, and its use established and extending. The petitioners had no doubt that, if a prolongation were granted, they would be enabled to obtain a fair remuneration, if not commensurate with the great public value and importance of the invention, yet probably sufficient to save them from the loss they had already sustained. It appeared that the inventors sold their patents in Great Britain, France, and America for sums amounting together to £30,000.

Lord WATSON, in delivering the judgment of their Lordships, said the important question which arose in the case appeared to be whether the petitioners were in a position to maintain the application. Cases which had been cited to their Lordships appeared to them to establish the principle that an assignee who had acquired a patent that was the subject of a commercial adventure was not entitled to obtain a prolongation when the inventor had no legitimate interest in making the application himself. In this case, the inventors would no longer have any interest in applying for a prolongation, because they had been sufficiently remunerated. There was no case to be found in which an extension had been granted to an assignee which did not directly or indirectly tend towards the benefit of the original inventor, who, had there been no assignation, would be in a position to claim the extension himself. In the present case, the inventors were not in that position. As their Lordships did not see any reason for departing from the principle already recognized in similar cases, they would recommend Her Majesty to refuse to grant the petition.

The Employees at the York Gas-Works and their Politics.

At the York City Police Court last Thursday, Thomas Brenthall, an employee at the York Gas-Works, and Robert Ellis Gerrard, of the *York Sentinel*, were charged with being guilty of disorderly behaviour by fighting in the streets. Brenthall was also summoned for assaulting Gerrard. The quarrel, which occurred on the previous Tuesday, arose out of the publication by Gerrard of a statement to the effect that because Mr. Charles Sellers, Engineer and Secretary of the York Gas Company, had refused to identify himself with the Liberal party in the recent parliamentary election, a number of the employees had decided to do the same. This assertion incensed Brenthall, who has been engaged for many years at the works, and stands extremely high in the estimation of his employers; and on meeting Gerrard in the street, an altercation occurred, which led to the parties being taken into custody. In the course of the proceedings on the summons, Mr. Wilkinson, who defended Brenthall, said the complainant was the editor of a scurrilous publication, which lived by slandering the citizens of York. The statement which had appeared in it about the gas men was a gross libel, and was absolutely untrue; and he suggested with confidence that the complainant knew it to be false when he wrote it. The paragraph was indignantly resented by his client and the men at the gas-works. They felt that the *Sentinel* had not only insulted them by insinuating that they had yielded to the Manager's influence to induce them to vote as he had done at the city election, but that it had also insulted the Manager by attributing to him conduct which was utterly false. Defendant was provoked, and with good reason. When he met Gerrard, he spoke to him about the paragraph, and asked for the names of his informants. Gerrard refused to give them; and, with a sneer, promised a "double dose" next week. Then followed the altercation. He (Mr. Wilkinson) said Brenthall might have struck Gerrard; and he cared very little if he did, as Gerrard richly deserved it. If he would libel men, and they could not get the remedy out of his pocket, they must get it out of his bones. Whatever decision the Bench came to, the thanks of the city were due to the defendant for what he had done. One of the men at the works was called to corroborate Mr. Wilkinson's version of the affair; and, in answer to the Bench, he stated that the paragraph in question had been the subject of much discussion among the men, and had caused them great annoyance. Their Worships said they had come to the conclusion that they must convict Brenthall of assaulting Gerrard, for which he would be fined 2s. 6d., without costs. For fighting in the street, Gerrard and Brenthall would be fined 5s. each, with costs. A number of working men had assembled outside the Court, and loudly cheered Brenthall when he came out; but Gerrard was heartily hooted.

A Fatal Omission in Summoning Water Companies.

At the Thames Police Court last Thursday, the East London Water-Works Company were summoned by Thomas Samuel Thorn, of 23, Matlock Street, Stepney, for not furnishing him with a supply of water. Mr. Bray and Mr. George Kebbell appeared for the Company; Mr. F. Deakin for the prosecutor. Mr. Deakin, in opening the case, said the summons was taken out under section 43 of the Water-Works Clauses Act; but there was a matter which must, of necessity, be proved before there could be a conviction. It was that the rent must have been paid or tendered by the person complaining; and he was bound to admit in this case it had not been done. At the same time, he contended the Company had waived their right by appointing collectors to collect the money at their own convenience. Mr. Mead said the omission to tender was fatal to the case. He did not think it was a case in which the waiving referred to was applicable, for it was a criminal offence. As a condition before the Company could be convicted under the section, the person complaining should either have paid or tendered his rate. This not having been done, an important element in the case was missing; and he had no option but to dismiss the summons.

Theft of Gas at Halifax.

At Halifax last Friday week, Jonas Hirst, an iron and tin-plate worker, carrying on business at Lee Bridge, was summoned, at the instance of the Corporation Gas Committee, for an offence under the Gas-Works Clauses Act. On June 13, one of the gas-meter inspectors (G. S. Clayton) called at defendant's workshop to examine the meter. On the work-bench he found a pan, in which lead was being melted by means of a gas-heater, which was being fed by an india-rubber tube. Defendant was in the workshop at the time; and as the inspector was walking towards the meter, he stepped in front of him. The inspector moved on one side, to get past, when defendant again stepped in front, as if to obstruct him. Then he went to the meter; and, before the inspector could get there, he suddenly wrenched the india-rubber tube away from its position at that end. As soon as he had done this, the gas-heater went out with a sudden explosion; and there was a strong smell of gas in the room. When the inspector reached the meter, he saw that the inlet-pipe was totally disconnected, that it was bent back a little, and that gas was escaping from it in full force. Seeing gas was being consumed, and that the inlet-pipe was disconnected, it followed that gas must have been taken from the main for the supply of the heater before passing through the meter. Defendant, on being charged at the time with improperly taking the gas, gave no explanation whatever. When, however, the inspector left, he followed him out, and asked him to look over the matter. The defence was that the defendant's lad, who had been using the gas-heater, found that the light received was not giving satisfaction. He accordingly, and without mentioning the matter to his master, went to the meter to charge it with water. Being unfamiliar, however, with its working, he unscrewed the inlet-pipe. Having done this, he went to the water-tap, and was in the act of getting water to take to the meter when the inspector put in his appearance. The lad also declared that the india-rubber tubing was attached to a branch-pipe in the wall, and not to the meter inlet-pipe. Evidence was given by the Gas Engineer (Mr. T. Holgate) and other officials. The Magistrates decided that the case was proved; and the full penalty of £5 was inflicted.

North Wales Cannel Collieries, Limited.—A Company has been registered under this title, with a capital of £75,000, in £1 shares (30,000 of them being 6 per cent. preference), to acquire the leasehold mineral properties known as the Coed Talon Collieries and Mineral Estates, and the Black Diamond Collieries and Mineral Estates, situate at Coed Talon, near Mold, Flintshire, North Wales, and to carry on the business of colliery proprietors.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., last Wednesday, Messrs. Fox and Bousfield sold parts of freehold shares in the *New River Company*. Two 120ths of an Adventurer's share—the last dividend in respect of each was at the rate of £21 15s. 8d. per annum—realized £830 each; while 1-40th of a similar share was knocked down at the comparatively cheaper price of £2420. Two 100ths of a King's share, ranking last Christmas for a dividend of £26 each, fetched £1780 together; and for two 150ths of a similar share, £650 each was obtained. On the same occasion, seven £100 fully-paid new shares were disposed of for £400 to £405 per share. The portions of Adventurers' shares sold at the rate of from £96,800 to £99,600 per share; the fractions of King's shares, at £89,000 and £90,000 per share. Ordinary £10 original shares in the *Maidstone Water Company* have been recently sold at £29 10s. and £30 10s. each; and £10 7 per cent. shares, at from £18 to £18 10s.

Reductions in Price.—At the meeting of the Accrington and District Joint Gas and Water Board on the 11th inst., it was decided to reduce the price of gas on Oct. 1 next to 2s. 6½d. net per 1000 cubic feet to consumers of 70,000 cubic feet per quarter and upwards, and to 2s. 9½d. net to consumers of a smaller quantity; being a reduction of 3½d. per 1000 cubic feet all round. It was further decided to reduce the price of gas supplied to local authorities for public street lighting to 2s. 6d. per 1000 cubic feet—a decrease of 4d.; the object being to induce the authorities to light the streets more effectively. The question of lowering the price has been under consideration for some months. The sinking fund, as it stands at present, will only permit of the concessions named; but if, at the end of the next quarter, or even before, there is such a large increase in the consumption of gas as the members of the Board hope, they will take into consideration the question of a further reduction, either for day gas or generally. The Redcar Gas Company have reduced the price of gas 6d. per 1000 cubic feet to all consumers within their district as from the 1st inst. The Enniscorthy Gas Company have made the substantial reduction of 5d. in the price of gas, which brings the charge down to 5s. per 1000 cubic feet.

MISCELLANEOUS NEWS.

GAS ENGINEERS AND THE PHOTOMETRIC STANDARDS INQUIRY.

In another part of the JOURNAL, we notice the issue, as a parliamentary paper, of the report of the Board of Trade Committee on Photometric Standards, and give an epitome of the appendix to that document. As already mentioned, Section XII. contains an account of the interview which took place between the Committee and a deputation representing the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute on the subject of gas testing. This section, in view of the interest attaching to the question under discussion, we reproduce in full below.

SECTION XII.—*Evidence and Recommendations of a Deputation from the Incorporated Institute of Gas Engineers, consisting of Messrs. Charles Hunt, R. O. Paterson, and J. Methven, and from the Incorporated Gas Institute, consisting of Messrs. W. A. Valon, Norton H. Humphrys, and J. West.*

The CHAIRMAN: Gentlemen, the Committee will be very glad to hear anything you have to say, and to consider it; and will be also grateful to you for any information you may be able to give them. The two bodies represented are the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute; and, unless you have made some arrangement among yourselves, as we were first addressed by the Institution of Gas Engineers, I will call on Mr. Hunt, as President of that Institution, to address us first.

Mr. *Charles Hunt:* Mr. Valon is here as President of The Gas Institute; and, after I have asked a question, he will perhaps introduce the resolutions which have been proposed by The Gas Institute. I may say that we are anxious—regarding this matter as one of importance to the gas industry generally, not merely confined to the Metropolis—to know, in the first place, how far the Commission have proceeded in their work, if you have no objection to tell us, and also to what extent it is intended to proceed in the alteration of the standard, or the present methods of photometric procedure.

The CHAIRMAN: I do not know that I am really in a position to answer that question. We were appointed to make a recommendation to the Board of Trade as to what should be the future standard; and we have not yet come to any decision as to what the future standard that we shall recommend should be. Of course, the reason of this appointment is in itself based upon the dissatisfaction that exists with regard to the use of an actual candle. I may go so far as to say that we are not likely to recommend the continued use of the candle; but beyond that, I do not think I am in a position to give any definite statement.

Mr. *Hunt:* Mr. Valon will now read the resolution.

Mr. *Valon:* We came to this resolution this morning. I should like to say we are unanimous in wishing to get from the Commission what information we can in regard to that. The resolution passed by the Incorporated Gas Institute this morning will, I think, embody our views. It was resolved—"That the opinion be strongly impressed upon the Committee that no standard will be acceptable to the gas interest generally unless based upon, and of the same relative value as, the existing parliamentary standard candle or unit of light. The representatives of the Incorporated Gas Institute would also urge on the Committee the necessity that the present obligations of gas suppliers should not in any way be injuriously affected." After this resolution, which was accepted unanimously by the Institution of Gas Engineers as well as ourselves, a further discussion took place among the representatives elected by the two Councils, who agreed unanimously, the result of which Mr. Hunt will perhaps now state to the Committee.

Mr. *Hunt:* The first resolution is: "That attention be drawn to Mr. Methven's experiments showing the influence of the hygrometric condition of the atmosphere on the pentane unit of light; correction for this source of error appearing to be necessary to enable the pentane candle to be used for standardizing." The second is: "That air carburetted with pentane be used for testing purposes." The third is: "That a multiple of the standard candle equal to 10 candles be produced for testing purposes, by the application of a screen to an Argand burner; and that all tests be performed with an open-bar photometer, not less than 60 inches in length." The fourth is: "That the rate of consumption of gas to be tested be adjusted as nearly as practicable to the maximum efficiency of the various standard burners."

The CHAIRMAN: Does any member of the Committee wish to ask Mr. Hunt or Mr. Valon any questions? Perhaps Mr. Hunt would explain rather more fully what he means by the rate of consumption of gas to be tested being adjusted as nearly as practicable to the maximum efficiency of the various standard burners.

Mr. *Hunt:* It means that, as at present, by keeping to the 5-feet rate for all qualities of gas, the different qualities of gas are not tested under uniform conditions—that is to say, 12, 13, and 14 candle gas is tested under adverse conditions, as compared with 16 and 17 candle gas. The standard burner is shown by experiments to be applicable to any gas up to 17 candles. At about 17 candles, it gives variable results. If the gas is turned up—whether it be 10, 12, or 14 candle gas—to a certain height in the chimney, so that the flame does not pass over the top, then you get practically equal results.

Mr. LIVESEY: You mean that 10, 12, or 13 candle gas, if turned up to that height, gives a light equal to 16 candles?

Mr. *Hunt:* It would give a light proportionate to the luminosity it is capable of developing.

Mr. HARCOURT: Not equal results; but proportionate comparable results?

Mr. *Hunt:* Yes, our object is to get the whole gas tested under equal conditions.

Mr. *West:* We cannot test 20-candle gas with the London standard burner consuming 5 cubic feet an hour.

Mr. LIVESEY: Could you not test it by consuming less than 5 feet an hour?

Mr. *West:* Yes; but we do not get the proper result.

The CHAIRMAN: Has the attention of your body been called to the terms of the Act of Parliament which says something to this effect: That the gas shall be of such quality that, when burned from a particular burner at the rate of 5 feet per hour, it shall give such and such a light?

Mr. *Hunt:* It has; but no Act of Parliament is incapable of being amended.

The CHAIRMAN: We are not called upon, as a Committee, to recommend any alteration of the Act of Parliament definition.

Mr. *Methven:* But the Act refers to the candle—the sperm candle.

Mr. *Hunt:* The sperm candle and to the parliamentary burner.

Mr. *West:* We cannot burn the 5 cubic feet an hour in Manchester. The standard burner is not capable of burning 5 feet an hour.

Dr. FRANKLAND: To consume a similar volume, I suppose you consume at a lower rate. Is that detrimental?

Mr. *West:* Really, we test with the flat-flame in Manchester.

The CHAIRMAN: That is the case also in London, is it not, with the higher illuminating gas? There are two standard burners in fact—the Argand and the flat-flame.

Mr. TREWBY: Yes; that is so.

Dr. FRANKLAND: The flat-flame is mentioned in the Act of Parliament, I think, for testing cannel gas; so that you have the opportunity of using the flat-flame according to the present Act of Parliament.

Mr. *Methven:* The idea in that resolution is to use the gas at the rate which produces the best result in the burner specified. I think that is the idea.

The CHAIRMAN: Of course, I am only asking you for information; it is not to discuss or contend against you in any way. How do you propose that that should be determined?

Mr. *Hunt:* Either by limiting the flame in the chimney, which would give you comparable results under all conditions, or by limiting the top of the flame to within two rings, which might be marked round the glass at about ½ inch from the top, or any height which might be determined; the object being to obtain an uniform height of flame.

Mr. LIVESEY: Have you considered the other way, of taking the 16-candle gas and burning such a quantity of gas as to give a light equal to 16 candles?

Mr. *Hunt:* Yes, we have carefully considered it; and we came to the conclusion that there is very great liability to error where the lights to be compared are equal. We would very much rather have a greater amount of inequality of light between the two—the standard and the gas to be compared. Moreover, an equality of light such as has been named would do away practically with the uniformity of testing for different qualities of gas, because, if you adopted a 16-candle standard for 16-candle gas, naturally you would go to 14 candles for 14-candle gas, and so on. So that the 14-candle gas would still have to be compared under disadvantageous conditions.

Mr. HARCOURT: I may not have followed you perfectly; but I do not quite understand your answer to apply to the question which Mr. Livesey asked. I did not understand the question to be that of having a standard which would be the same with each quality of gas to be tested; but whether it would meet your views, or nearly meet them, if testings be made with a London Argand burner consuming such a quantity of gas as would give with that burner a light of 16 candles, and make the photometric result depend on the estimation of the volume of gas that needed then to be burnt.

Mr. *Hunt:* I think my answer is strictly applicable to that question, because, in the first place, there is a difficulty in ascertaining the exact illuminating power where the two lights are alike. There is a difficulty in the disc. Those who have made experiments with me, find that, with equal luminosity on each side of the disc, there is much greater difficulty than if one side of the disc is under illuminated. The question of range comes in, and it is very much smaller.

Mr. HARCOURT: Smaller?

Mr. *Hunt:* Very much less.

Mr. HARCOURT: My impression is that it is greater.

Mr. *Hunt:* That is our experience of it.

Mr. HARCOURT: That is a simple matter of geometry; and it is easily solved positively. My impression is that the range is greater near the middle of the bar. If you have a small light which is near the disc, a small movement of the disc makes a considerable difference of illumination; and to produce a given difference of illumination, you have but a small range through which the disc has to be moved. If, on the other hand, the disc is at a considerable distance—say, half the length of the bar—from each of the two sources of light from which it receives the light, you have to move the disc a much greater distance to produce the same difference of illumination. I do not think there can be two opinions about that.

Mr. *Paterson:* Perhaps there is a little confusion arising there. We do not exactly say that the range is less upon the position of the disc when we are testing with a 16-candle standard a 16-candle gas; but what we say is that the possibility of error—that is to say, the light upon two sides of the disc, the two lights of 16 candles each at either end of the bar—is such that the range of observation is limited to a very small space indeed, and the difficulty of determining that position is correspondingly great. But where you have a smaller field at one end than at the other, there is less difficulty in determining the neutral point, if I may say so, of the disc. Hence, our recommendation, which we would beg strongly to urge, of a 10-candle standard rather than a higher. We have also considered the question of the great convenience of a 10-candle standard as applicable to all conditions of gas-testing throughout the kingdom. I need not point out the convenience of that; but I am illustrating it. Supposing you are testing 16-candle gas with a 10-candle standard, the position of the disc, presumably, on the bar would be 1·6 and not 1. By moving your position to the right, you have your value, whatever gas it may be you are testing.

Mr. HARCOURT: I should like to point out that we have here two distinct questions before us—the one is the magnitude of the standard to be employed, the other is a question of whether the gas burning at the standard burner should be burnt in such a way as to fill the chimney, or in such a way as it does burn when 5 cubic feet of gas of varying quality is supplied to it, or in such a way as would yield a light of 16 candles. I would submit that that question is entirely distinct from the question (also important) of whether the standard with which it is to be compared should itself be of the value of 2 candles, or 10 candles, or 16 candles.

Mr. LIVESEY: We will deal with the flame first.

The CHAIRMAN: I think the Committee would be glad to hear any opinions of the representatives of these two bodies on both points stated by Mr. Harcourt. The point we have had specially before us until this meeting was allowing the gas to be tested to be burnt as it is now at the rate of 5 cubic feet an hour, or at such a rate that it gives the light required of 16 candles, so as to give a light of 16 candles if it is to be 16 candles, and then measuring the quantity burnt, or, as you suggest, at a particular height.

Dr. POLE: I do not know whether you know the Paris system of testing. It is exactly what is described here. The gas is made to burn to match a certain standard light, no matter what it burns; then the quality of the gas is gauged by the quantity of gas that is required. That plan has been adopted from time immemorial in France; and that is exactly what you wish, is it not?

Mr. *Hunt:* No; we wish to have a greater difference.

Dr. POLE: That is the other question; but I mean as to the flame. That is a question as to what the size of the standard should be. The French plan might be adopted with any kind of standard.

Mr. *Hunt:* What we propose is that the gas in all cases should be burnt at a uniform height in the chimney, and then tested, whatever might be its rate, regardless of the light it gives.

Mr. LIVESEY: Then you would have a double calculation. If the standard be 16; and it burns up to this height, it may give 17 candles?

Mr. *Hunt:* Yes.

Mr. LIVESEY: Then you have to make a double calculation to reduce it to 16, and then see what quantity of gas is burnt?

Mr. *Hunt:* You have to correct in all cases for the consumption.

Mr. LIVESEY: Yes; but as Dr. Pole and Mr. Harcourt put it, that is the only correction to be made with the French system.

Mr. *Hunt:* In the system we propose, there is only one correction, and that is for the consumption.

Mr. LIVESEY: Suppose 4½ feet gave 17-candle power?

Mr. *Hunt:* Then you have to multiply by 5, and divide by 4½.

Mr. *Methven:* I think, gentlemen, the question arises, if I might be permitted to make a suggestion, in this way: Provided that the present standard burner is used, those companies which supply 16-candle gas are better off than those which are tested by the same burner, and have to supply only 15-candle gas. The burner was originally designed and constructed to develop the light (we may say tolerably accurately) of 16-candle gas. Now, when 15-candle or 14-candle gas is burnt in the same burner, burning at the rate of 5 cubic feet an hour, the gas is not represented at its proper illuminating value. In other words, if the rate of supply to the burner were increased beyond 5 feet, the conditions under which 14-candle gas would then be burnt would be something similar to the conditions under which 16-candle gas would be burnt. It is with that view, I think, that we have framed this resolution. It is to cover the varying qualities of gas, and so treat them as to compare them under the same conditions.

The CHAIRMAN: What you mention is in accordance with what Dr. Pole has just said.

Mr. *Methven:* I think I am representing the views of our Committee correctly. Mr. Hunt will correct me if I am not; but I think that is the idea.

Mr. *Hunt:* I do not think it is quite the same thing as Dr. Pole has explained to us as the Paris system. I understand the Paris system is equal luminosity.

The CHAIRMAN: Equal luminosity of disc; not necessarily equal luminosity of the two sources of light on the opposite sides.

Mr. *Hunt:* The disc is fixed. In our case, we do not propose that the disc should be fixed.

The CHAIRMAN: That is really a mechanical question, whether the disc is to be movable or one of the lights.

Mr. POLE: In France nothing is movable.

The CHAIRMAN: Except the stop-cock.

Mr. HARCOURT: That really is the principle. With the 16-candle standard, the position of the disc would be mid-way; with a 10-candle standard, it would be fixed at the point 1·6. But in any case both the light and the disc would be fixed; and the measurement would be of the rate of consumption.

The CHAIRMAN: What is the objection you urge to that proposal, supposing there was a 10-candle standard light on the one side and gas on the other?

Mr. *Hunt:* Practically you would still be fixed to the 5-feet rate.

The CHAIRMAN: No; it would simply have to be calculated.

Mr. TREWBY: You would have to fix the 16-candle standard in the one case or the 15-candle in the other.

Mr. *Hunt:* Within a very slight range, you would be limited to 5 feet, because your object would be to give 14 or 15 candles illumination. If 5 feet will not give it, you may have to turn it up to 5·1 or 5·2 feet; but beyond that you will not go. You will not, under that system, get uniform testing for all qualities of gas.

Mr. LIVESEY: You mean 14, 15, 16, or 17 candles?

Mr. *Hunt:* 14 candles to 17 candles.

Dr. POLE: You might have so low a quality that the burner would not burn it without going above the chimney, which would be detrimental, of course.

Mr. *Hunt:* We have not met with a case of very low quality.

Dr. POLE: Would 14-candle gas burn in the ordinary Argand burner so as to give the same light?

Mr. *Hunt:* Oh, yes; practically the same light as 17-candle gas.

Dr. POLE: Without going above the chimney?

Mr. *Hunt:* Yes.

Mr. HARCOURT: And if you knew nothing of the consumption, you would not know which was which?

Mr. LIVESEY: Only if this was 14-candle gas, you would say that, burning to give a light equal to 14 candles, you are not doing the best with the gas.

Mr. *Hunt:* That is so by limiting it to 14 candles.
Mr. *West:* With the same burner and chimney.
Dr. POLE: If you get a reasonable flame, it seems to me the French method is unobjectionable. If you get a reasonable flame with several qualities of gas on the same burner, it simply tells you how much gas is required in each case, and that is their definition of their quality.
Mr. *Hunt:* That does not meet the objection we have to the different qualities of gas being tested under these conditions.
Dr. POLE: I am afraid I do not understand it.
Mr. LIVESEY: Suppose all gas were 16 candles, would you then say the same?
Mr. *Hunt:* No.
Mr. LIVESEY: You would then adopt Dr. Pole's suggestion?
Mr. *Hunt:* Yes.
Mr. LIVESEY: It is to meet the case of lower qualities?
Mr. *Hunt:* Yes.
Mr. LIVESEY: You think it would not be practicable to have a different burner?
Mr. *Methven:* The burner existing in London is generally adopted in the Provinces.
Dr. POLE: Is it adopted regardless of the quality of the gas that has to be tested? Suppose the company has only to give 14-candle gas by their Act, you would not adopt the London burner, would you?
Mr. *Methven:* I should advise a company not to do that; but I believe the standard burner is accepted—the light from a standard Argand generally.
Mr. HARCOURT: You would use a chimney of less diameter.
Mr. *Paterson:* 15-candle gas is tested with a No. 1 London Argand burner, with an ordinary chimney, 6 by 1⅞ inches.
Mr. LIVESEY: By your Act of Parliament?
Mr. *Paterson:* Yes.
Mr. HARCOURT: A 1¾-inch chimney is ordinarily employed with gas of lower quality; 2 inches is the fixed diameter for London gas.
Mr. *Hunt:* It makes very little difference.
Mr. *Methven:* We should like to go farther than that.
Mr. *Hunt:* To get a uniform chimney, a uniform bar, and a uniform height of flame.
Mr. *Paterson:* The contention being that the No. 1 London Argand burner is a 16-candle burner.
The CHAIRMAN: Assuming that 14-candle gas is to be burnt out of a 16-candle Argand burner, you think there would be a disadvantage in getting a light of 14 candles, and measuring the quantity of gas that is required to give it, as compared with turning up the flame to a particular height.
Mr. *Hunt:* Certainly.
The CHAIRMAN: Turning up the flame to the height at which it gave 14 candles, and measuring the amount of gas which was required to give 14 candles, would not that be in effect the same thing?
Mr. *Hunt:* No, very different.
Mr. LIVESEY: You would turn up the flame, Mr. Chairman, to give 16 candles. He says that the 14-candle gas would burn at a disadvantage in the 16-candle burner, unless you turn it up to the height that it will give 16 candles.
Mr. *Hunt:* You want all gas to be burnt at the same height of flame in the chimney.
Dr. RUSSELL: You can get that by burning a sufficient quantity of gas; but when you have that extra quantity, the gas does not burn to good advantage.
Mr. *Hunt:* When you have a smaller quantity, it does not burn to advantage.
The CHAIRMAN: Would it not also meet your view if the gas were burnt at such a rate as to give the light of 16 candles, and you then calculated it down to 14 candles?
Mr. *Hunt:* It would go a long way to meeting our views; but still it would not give the uniformity we want. What we are anxious to get is uniformity for all qualities of gas up to 16 candles, which we regard as the maximum for coal gas.
Mr. TREWBY: To develop the full luminosity of the burner?
Mr. *Hunt:* Yes, up to 16 candles.
The CHAIRMAN: You would develop the full luminosity if you burnt 14 candles at such a rate as would give the light of 16 candles.
Mr. *Hunt:* Very nearly, not quite.
Dr. POLE: That would be the French plan.
Mr. HARCOURT: You would burn it so as to get rather more.
Mr. *Hunt:* Probably you would get 18 or 19 candles out of a full chimney, whatever may be the quantity of gas.
Mr. HARCOURT: Did you get that with a 6 inch by 2 inch chimney?
Mr. *Hunt:* That will give something about 19 candles.
Dr. POLE: The tester knows nothing about the quality of the gas until he tests it; he knows nothing about the standard and the gas-meter. What has he to do?
Mr. LIVESEY: Burn the gas up to a certain mark on the chimney; and then you want a double calculation.
Mr. *Hunt:* You ascertain by the position of the disc the illuminating power; and you correct that by the consumption to find the quality.
Mr. HARCOURT: You have two variables—the position of the disc, and the rate of consumption?
Mr. *Hunt:* You have two variables; but only one correction, as in the case of the fixed disc.
Dr. POLE: He cannot have his result without calculating both elements.
Mr. HARCOURT: Mr. Hunt means that the bar does the calculation for him in one respect.
Dr. FRANKLAND: You could not have a bar that would be graduated so as to do the calculation for you of all these different qualities of gas?
Mr. *Hunt:* Bars are already graduated.
Dr. FRANKLAND: Yes, for a particular quality of gas.
The CHAIRMAN: If you burn in a 16-candle Argand burner 14-candle gas, so as to give the light of 16 candles, of course you burn more gas, and get more heat. Do you not increase the draught a great deal, so as to get a disadvantage there against the gas?
Mr. *Hunt:* It is found, by experiment with the Argand burner, that the lower the flame, the greater the proportionate amount of air; and this destroys the luminosity. Whether it is increased or decreased by the chimney being full, I am not able to say; but at all events the effect is improved—that is to say, the amount of air going to the flame is more nearly proportionate to the need of luminous combustion.
Mr. LIVESEY: With a low flame, you get too much air?
Mr. *Hunt:* Yes.
Dr. FRANKLAND: Independently of the draught in the chimney, is it not the fact that the greater the volume of gas you burn in one flame, the higher the illuminating power per foot of gas? It used to be so.
Mr. *Hunt:* That is certainly the case with the Argand burner up to a certain point.
Dr. FRANKLAND: I mean independently of the draught.
Mr. *Hunt:* It is really the matter of draught; it is really the matter of supplying air to the burner.
Dr. POLE: The Lowe jet assumed a certain height, and corresponding to a certain height of flame; and you measured then the quantity. Does this apply also to the burning of various quantities in the London Argand burner? If so, the position is quite intelligible.
Mr. *Hunt:* I think it is quite a mistake to assume that the height of flame is absolute.
Dr. POLE: That is of the Lowe jet.
Mr. *Methven:* Provided the specific gravity of the gas remains constant.
Mr. LIVESEY: The jet is not absolutely reliable.
Mr. *Hunt:* Nor is the height of the flame in the Argand burner reliable.
Mr. TREWBY: We have not heard Mr. Methven about the hygrometric conditions of the atmosphere.
Mr. *Methven:* I was rather anxious to know, Sir, whether any steps had been taken by Mr. Harcourt to alter his standard flame, or rather to correct it for the influence operating on the pentane unit by the varying hygrometric conditions of the atmosphere. It seems to me that, if this standard is to be lodged as a standard from which other lights are to be measured and compared, it must be one that would give the same light at all seasons of the year, and under all conditions of the atmosphere. My experience has led me to believe that the flames do not develop the same amount of light under the varying hygrometric conditions of the air, and that the flames are more susceptible the smaller their power may be. That is to say, the flame of the Argand burner is not so susceptible to hygrometric changes of the atmosphere as a flame of the size of the pentane unit of light. I was particularly anxious, before this standard was adopted by the Committee as the standard of light, that a consideration of this subject should be made. My impression is that there is an influence at work in the varying changes of the atmosphere which would, unless corrected in some manner, prevent the same development of light from the standard under the altered conditions of the air. It seems to me very necessary that this should be made perfectly clear before this standard is introduced.
The CHAIRMAN: Is that conclusion you have come to the result of any direct experiments you have made?
Mr. *Methven:* Direct experiments on the same subject, Sir. My experiments were conducted as a good many other laboratory experiments are—I have taken extreme measures. I have noted the development of light from the flame when it has been supplied with perfectly dry air, and also when it has been supplied with perfectly saturated air. I have also made my experiments over a range of temperature such as I have known to exist in some of the testing-places of the Metropolis; and under these extreme conditions of perfectly dry atmospheres and perfectly saturated atmospheres, in the development of light from the pentane burner, I have discovered a very serious difference. The experiments are published in my paper which I read before the Southern District Association of Gas Managers.* If you have the reference there, it would prevent my making mistakes. I am always afraid to say to what extent variation does take place; but it is rather large.
Dr. FRANKLAND: I presume they were made with the 1-candle pentane burner?
Mr. *Methven:* Yes. If the Committee could spare me the time, I might read a few remarks I made in that paper. [Mr. Methven then read a passage from the paper.]
Dr. FRANKLAND: There are two conditions somewhat mixed together there, are there not—that is, an increase in moisture, or a difference between dry air and moist air, and at the same time and in the same experiment differences of temperature? Can you separate one from the other? How do you know how much was due to difference in temperature, and how much to dry and moist air?
Mr. *Methven:* I think I have done that. The idea was to make the range of temperature a factor in the matter, because I knew that the higher the temperature of the air, the more moisture it would conduct into the neighbourhood of the flame.
Mr. LIVESEY: How would that affect the use of the pentane standard?
Mr. *Methven:* In this way. Suppose the pentane standard has been adopted and lodged with the Warden of the Standards, as a standard with which other lights are to be compared. If it was called into operation on a very wet day in the summer, it would return a certain value to the lights opposed to it or to the standards.
Mr. LIVESEY: It would give less light than on a dry day in winter?
Mr. *Methven:* It would represent the standard it was opposed to as being of higher value in the summer on a wet day than in the winter on a dry day. Then I say it is necessary, if there is anything in my argument at all, to consider it. I am quite open to be corrected by anyone who has made similar experiments; but I could not very well, with the knowledge I have on the subject, allow this matter to go forward without mentioning it.
Dr. FRANKLAND: I think I understand you to say that one cause of the difference was the smallness of the pentane flame as compared with the gas-flame; that it affected a small flame less than a large one?
Mr. *Methven:* To a great degree, owing possibly to the character of the small flame.
Dr. FRANKLAND: Suppose a pentane flame more nearly approached the luminosity of the gas-flame, would not the moisture or dryness be compensated for in the two flames?
Mr. *Methven:* It would serve the two flames in exactly the same

*See JOURNAL, Vol. LIV., p. 968.

way; but in this case I take it you are determining the new pentane unit of light which is supposed to be equal to 1 candle, and from that pentane unit, I take it, you propose to standardize other standards—for instance, in developing the 16-candle standard, is not that so?

The CHAIRMAN: You may take that for the present at any rate.

Mr. *Methven:* So you see the importance of starting accurately.

Dr. FRANKLAND: Yes.

Mr. LIVESEY: If Mr. Sugg (say) makes a certain number of 16-light burners, and takes them to the Board of Trade to be standardized with the pentane in the summer, when the atmosphere is charged with moisture, those 16 candles would give a different amount of light to what another lot of burners would give if standardized in the winter on a dry day.

Mr. *Methven:* Yes.

Mr. *West:* I should like, Sir, to call attention to this resolution. It was resolved—"That the opinion be strongly impressed upon the Committee that no standard will be acceptable to the gas interest generally unless based upon, and of the same relative value as, the existing parliamentary standard candle or unit of light." I think the idea is that, if you adopt the pentane standard, it should first be ascertained if that is comparable to, and is of the same value as, the standard candle of light. If experiments are made, you will find that the pentane standard candle gives you more light than the standard candle gives; and if that is so (which I myself have no doubt about), it would be very much against the interest of gas companies to adopt it as a standard. That is a subject perhaps the Committee might have investigated; but from experiments I made some years ago, I found the pentane standard, when consuming 0·5 cubic foot per hour, gave more light than the standard candle. It is very important, if it has not already been ascertained to be in that position, that the Committee should have an investigation made. I look on it as one of the most important questions under consideration, that we should really know what value the pentane standard has in relation to the standard candle—that is, to the unit of light in all existing Acts of Parliament.

Mr. LIVESEY: Your resolution was that we should still retain the nominal standard candle.

Mr. *West:* Certainly; I wish to call particular attention to it.

Mr. *Hunt:* The value of the candle; not the candle itself.

Mr. *West:* My experiments worked out with Mr. Vernon Harcourt's pentane flame, gave more light than the candle did.

Mr. TREWBY: To what extent?

Mr. *West:* 3 or 4 per cent.

Mr. LIVESEY: What we have to find out is what is the equivalent of the average candle in pentane.

Mr. *West:* That is what I suggest. It is a very important matter for all gas companies.

The CHAIRMAN: You may be quite sure that this point will have full attention given to it.

Mr. LIVESEY: There is the point mentioned by Mr. Paterson as to the illumination of the disc. I understand him to say the brighter the illumination of the disc, the less easy it is to read compared with one not so brightly illuminated. Could you not get over that by lengthening the bar?

Mr. *Paterson:* Or having a 10-candle standard, which would be universally applicable to any quality of gas?

Mr. LIVESEY: Have you any objection to 10, 16, and 20 candle standards standardized from the same unit?

Mr. *Paterson:* We would urge the importance of having one standard, for this reason: Suppose you are legislating, there is legislation for more than one standard. There is 16 candles for London, 20 candles for cannel gas, and probably the general provincial standard is for 10 candles. We should be in this position, in all cases if there was an application made to Parliament, there would be a contention over the standard.

Mr. LIVESEY: How the gas was to be tested?

Mr. *Paterson:* Yes. There are in the provinces companies which at present are supplying 16-candle gas. There would be a contention between the local authority and the company whether it should be a 10-candle or 16-candle test. On that ground, we strongly recommend only one standard as a measure of light. Presumably you adopt the pentane as the unit, and standardize the 10-candle measure or the 10-candle standard, whichever you may call it, from pentane. There you have a unit of measure applicable to all conditions of photometrical testing in the kingdom.

Mr. LIVESEY: From 14 candles up to 28 or 30 candles?

Mr. *Paterson:* Whatever it may be.

Dr. POLE: Is not there a general wish that the distance from the disc to the two lights should be pretty nearly equal, on account of the fog, and so on? That would not be the case if you were measuring 16-candle gas with 10 candles.

Mr. *Paterson:* We find the difference between the distance of the two lights with 10 candles or 16 candles is reduced to a few inches.

Dr. POLE: You think it would not matter?

Mr. *Paterson:* No.

Mr. LIVESEY: You do not have fogs in Cheltenham as we do in London.

Mr. *Paterson:* I do not think you would be injured at all by the distance between 10 and 16 candles.

Mr. LIVESEY: There are 7½ inches between 10 and 16 candles.

Mr. *Hunt:* It is understood that the resolutions we have submitted on both sides are unanimous as regards the two Institutions.

The CHAIRMAN: Yes. We are really very much obliged to you for what you have told us. Many of the points you have urged are matters we have already had under consideration; and those we have not had under consideration, I can assure you we will give our attention to.

The deputation then withdrew.

Additional Coal Storage for the Leeds Gas-Works.—The accommodation for the storage of coal at the York Road Gas-Works of the Leeds Corporation has been inadequate for some time past; and last week a contract was let to Messrs. Oakes and Son, of Hunslet, for the erection of new coal-stores upon land recently purchased for the purpose. The amount of the tender was £1655.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held yesterday week, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. J. BLACKETT GILL in the chair.

The SECRETARY and GENERAL MANAGER (Mr. W. Williams) read the notice convening the meeting; and also the statement of accounts, and the following report of the Directors:—

Various unfavourable circumstances have prejudicially affected the Company's business during the past financial year, with the result that the aggregate rental at the seven stations shows a reduction of 1½ per cent., as compared with the previous year.

First among the causes of this decrease in rental must be mentioned the exceptionally severe weather experienced during the month of February, which so seriously interfered with business generally in provincial towns that all shops were closed early, and consequently less gas was burnt. Nearly half of the entire loss of rental for the year occurred during this month.

In the next place, the Company have now, with one exception, to contend with the electric light at all the stations. The Directors have, in many cases, been able to meet this competition by introducing incandescent gas-burners, and by making special concessions in price to large consumers; but, in spite of these measures, they have to acknowledge that their efforts are not entirely successful, and that, where the cost of lighting is not a consideration, they frequently lose good customers. The number of consumers on the Company's books is constantly increasing; but the shareholders will understand that, when a factory or large *café* abandons gas, many small consumers are required to make up the rental thus lost.

For many years, the Board have directed their efforts to extending the use of gas among small consumers; and, as a further step in this direction, they have decided to introduce prepayment meters at three of their stations—viz., Bolbec, Rouen, and Havre, where they have reason to believe the system will be a success. If such prove to be the case, similar measures will be adopted at other stations; and in this way the Board hope to greatly develop the use of gas among the working classes.

Coal is still being supplied under the contracts made in 1893; and therefore has not varied in price. But at one station—viz., Nantes—the cost has been enhanced by increased dues levied by the Municipality. This increase is a matter of considerable importance to the Company, as it represents an additional charge to the Nantes works of nearly £2000 per annum. The Directors have taken the highest legal opinion on the subject, and are advised that the Municipality of Nantes are not justified in enforcing payment of these dues. Under these circumstances, finding it impossible to come to an amicable arrangement with the authorities, the Directors, although very reluctant to engage in litigation with the town, felt it incumbent on them, in justice to the shareholders, to have the question tested in a Court of Law, and have instituted proceedings for that purpose.

The mild weather which prevailed during the early part of the winter, interfered with the ready sale of coke; and prices had to be reduced. But the extreme rigour of the season later on, although in some ways unfavourable to the Company's business, as already mentioned, enabled the Managers, in most cases, to dispose of their stocks of coke; and prices have since been advanced wherever possible. The total revenue, however, from coke is somewhat less than that obtained last year. Tar has slightly improved in value; but there has been a heavy fall in the price of sulphate of ammonia.

The Directors have had under consideration the rates hitherto carried for depreciation and redemption of capital—a fund which is rendered necessary by the fact that the Company's concessions are all terminable. After careful examination, they have found it possible to reduce the amount hitherto set aside each year for this fund, and thus, while continuing to carry annually a sum sufficient for the purpose in view, leave a larger amount of profits available for distribution. The Directors are therefore able, in spite of the disadvantages under which the Company have laboured during the year, to recommend the payment of the usual dividend—viz., 20s. per share on the fully-paid shares, and 15s. per share on those £7 10s. paid, less the interim dividend of 8s. and 6s. per share respectively paid on the 1st of February last; also the payment of a special bonus of 1 per cent. on all shares, according to the amount paid thereon. As the net profits for the year are £942 short of the amount required to pay above dividend and bonus, the Board propose that the difference be taken from the reserve of undivided profits. Both dividend and bonus would be paid free of income-tax on the 1st prox.

The Directors have to report, with much regret, the death of Mr. F. J. Roan, one of the Company's Auditors. Pursuant to the Regulations, they have temporarily filled up the vacancy, and appointed F. M. Fry, Esq., a duly qualified shareholder, to the post until the present meeting.

Notice has been given that two Directors (E. T. E. Besley, Esq., Q.C., and E. F. White, Esq.) and both Auditors (J. Reeson, Esq., and F. M. Fry, Esq.) retire from office at this meeting. All being eligible, they offer themselves for re-election.

The CHAIRMAN said the report which the shareholders had heard read entered so fully into the particulars of the business the Company had done during the past year that he did not know there was very much scope left for him, nor many points of interest he could dwell upon; but still he should like to say a few words on the accounts generally, which he must regard as satisfactory. The first thing that met them was, of course, the loss in the rental, which amounted to £3525—that was, at the rate of 1½ per cent. Circumstances over which the Directors had no control caused this. There was one satisfactory feature connected with this point—that the day consumption had increased by 2 per cent., raising it to 31 per cent. of the total consumption. This was particularly satisfactory; and it showed that their 40,000 stoves and more than 300 gas-engines were doing excellent work in earning for the shareholders a good profit. The consumers had been augmented by nearly 1000; so that the total number was now 31,000. With reference to the residual products, the increase in tar amounted to £480; but coke showed a loss of £826. This was accounted for to a great extent by the cement trade, which had been very bad both in this country and in France; and this, with the severe weather, accounted for the loss in revenue. There had been also a serious diminution in the item of sulphate of ammonia; the receipts being £1255 less than last year. Sulphate had been a drug both in this country and in France; and the Company had had considerable difficulty in getting rid of it. However, they were told by those who knew something about it that the worst had passed; and things were beginning to move up. He hoped this was so for all their sakes. They found the profit had increased by £4540. Some of the shareholders might say: "You have spoken of several losses, how is it the profit has increased?" The Directors had been re-arranging the accounts somewhat; and they had come to the conclusion that the amount of money placed to redemption and depreciation account might be somewhat lessened. He could

assure the shareholders that the present Board were fully alive to their duty in keeping this account up; so that they need be under no apprehension in this respect. By the course just mentioned, and, with £942 from the undivided profits (which stood at a satisfactory figure), the balance would enable them to pay a dividend and bonus at the same rate as last year. It would be recollected that, at the last meeting, he told them the bonus must be regarded as a special bonus; but their accounts were generally in such a healthy and satisfactory condition, that he did not think they need hesitate for a moment in enjoying the 1 per cent. bonus which it was proposed to declare on this occasion. The coal contracts entered into two years ago would last another year; but they were at a slightly higher figure than the present price. The Directors had arranged with some of the colliery owners to carry on the contracts for two years longer at a reduced figure; but the price now ruling for coal was very low—almost as low as it had been for years, which was a very good thing for gas companies, but he did not know that it was the most fortunate thing for the country. He and the General Manager had visited the Company's stations this year; and they found everything in a satisfactory condition as far as the works were concerned. They could not help being struck, however, by the great inroads electricity had already made among the consumers, because there were no shops of any standing at all that had not the electric light. The *cafés* were their most important consumers; and they had succeeded, by the aid of incandescent burners, in keeping out the enemy in a few cases. The proprietors told them that the people who visited the *cafés* almost insisted on the electric light—no matter at what cost; so that the Company found it very difficult to compete with it. In this country, a less price was charged for gas; and there was no doubt that the only way to compete with electricity was by cheapness. But though it was very desirable in the case of their Company, perhaps it was not altogether feasible, because they worked under very different conditions to the Metropolitan Companies. They had concessions from the Municipalities, who were glad to have a finger in their pie. The consequence was the Company could not charge so low as they could wish, because they had to pay considerable dues to the Municipalities. The report alluded to Nantes, where there was a case in point. Some years ago, a new agreement was made with the Municipality, and the concession was extended for a certain number of years. Nothing was said about *octroi* at all. To the great astonishment of the Directors, after the agreement was signed, an *octroi* was put upon the coal. The Directors protested, and hoped that some means of settling the difficulty might be found. But the Municipality had now doubled the *octroi;* and the shareholders would at once see that the extra £2000 a year at a station like Nantes was a very serious thing. The Directors had instructed one of the ablest barristers at the French Bar to fight the battles of the Company for them; but the law's delay in France was very much the same as the law's delay in England. The matter was pursuing its course; but it might be some time before they obtained a decision. By way of stimulating trade, the Board were thinking of introducing coin meters at three of their stations. They believed that these would be a great success in France, as they were in this country. Here the charge was a penny for 25 cubic feet of gas; but they would have to charge 10 centimes for about half that quantity of gas in France. This would possibly militate somewhat against the success of the system. The French workmen were different to English workmen. They were paid fortnightly; and the Company collected fortnightly in many of their districts. The Frenchman nearly always paid his gas bill; and the shareholders would see this was so when he stated that, although the total rental amounted to £236,000, they only lost £380 by bad debts. He (the Chairman) thought this was a remarkable record. It showed that the collectors were doing their work in an admirable manner; and that their customers were thrifty, and kept up to their obligations. Indeed, the bad debts would compare well with any company in this country. At the various stations, they had shops, in which were gas-fittings and every kind of appliances for lighting and cooking, and which were in charge of intelligent attendants. In these shops at night time, they created great illumination, which paled the electric light altogether; and probably some of the coin meters would be fixed in them, so that their working could be explained to the public. He was sorry to say that death had been busy in connection with the Company both at home and abroad. Among their friends abroad, they had lost M. Alépée, who had been for more than forty years in the service of the Company, and for many years had been their Manager at Havre. They greatly regretted losing one who had served the Company so faithfully and well. The Directors had induced M. Coindet, of the Rouen station, who had been with the Company 38 years, to take the responsible post at Havre; and they knew they would derive great benefit from this appointment. M. Gautier, of Boulogne, succeeded M. Coindet at Rouen; and they had given to M. Marchal, the Sub-Engineer at Havre, the management of the Boulogne works. The Company had also had the misfortune to lose Mr. Roan, who had served them faithfully as an Auditor for a number of years; and the Board, acting on the Articles of Association, had secured a properly qualified proprietor to assist Mr. Reeson to finish off the accounts. They selected for this work Mr. F. Morris Fry. He was a gentleman of position in the City; and he had spare time on his hands. Of course, it was entirely a question for the shareholders whether or not they re-elected him. In conclusion, the Chairman congratulated the shareholders upon the state of the Company. They had, he said, heard that day from Havre and Rouen that they had more applications for gas than they were really able to fit up; and the Directors were taking steps to supply this deficiency at once. Looking generally at the position of the Company, he saw nothing to prevent them—if not achieving such success as they had in the past, and advancing by leaps and bounds to prosperity—earning for years to come a fair and good dividend. He then moved that the report and statement of accounts be received and adopted.

Mr. N. E. B. GAREY seconded the motion, which was agreed to.

The dividend and bonus having been declared,

The CHAIRMAN moved the re-election as a Director of Mr. E. T. E. Besley; and he took the opportunity of congratulating him upon the honour Her Majesty had recently conferred upon him in making him a Queen's Counsel.

Mr. GAREY seconded the motion, which was passed.

On the proposition of the CHAIRMAN, seconded by Mr. BESLEY, Mr. E. F. White was also re-elected a Director.

The Auditors having been re-appointed,

Mr. H. E. JONES moved, and Mr. MARTIN seconded, a vote of thanks to the Chairman and Directors.

The CHAIRMAN, having responded, referred in eulogistic terms to the attention bestowed upon their work by the officials and the staffs at home and abroad, and moved a vote of thanks to them for their services.

Mr. WATSON seconded the motion, which was heartily agreed to.

Mr. WILLIAMS suitably acknowledged the vote; and the proceedings then terminated.

ELECTRIC LIGHTING NOTES.

At the Meeting of the London County Council last Tuesday, the Highways Committee brought up a scheme for establishing the electric light on the Victoria Embankment and Westminster and Waterloo Bridges, for which purpose the Council obtained authority in their General Powers Act of 1893; £15,000 being provided in the Money Act of that year. The matter was before the Council last year, when its consideration was adjourned. In the revised scheme now proposed, duplicate plant is provided for; either set of plant being capable of lighting the Embankment and the bridges. The generating station is to be of fireproof construction, so securing the maximum of safety. The cost of the buildings has been reduced by omitting some of the more expensive items of ornamentation proposed in the original scheme; but the buildings will be quite as efficient. The electric lamp standards would be placed on the kerb of each of the footways—leaving the parapet lamps to be lighted, when required, by gas as at present; and the existing standards on the two bridges would be fitted with the electric light. It is proposed to provide 83 lamps in all. The Committee pointed out that the light on the Embankment would necessarily be to some extent obscured by the trees at the sides of the footways; and they did not see their way to obviate this. Should the Council decide to adopt the scheme, they proposed to ask the Technical Education Board to allow the inspectors of art schools and classes to assist them by preparing designs for the standards; and they hoped to be able to obtain a design for a standard and lamp which would be worthy of being placed in this, the finest thoroughfare in London. The capital cost of the scheme is estimated at £16,590, made up of the following items: Buildings, £4600; boilers and machinery, £5200; mains, £2250; lamps and standards, £4240; salaries, £300. About £3000 of the total expense is in respect of the two bridges. The estimated annual cost of maintenance is £2768, in which is included: Wages, £700; coal, £375; other stores and carbons, £325; repairs, £613; loan (interest and repayment), £672; rates and taxes, £83. In making these estimates, it has been assumed that the repayment of the loan would be spread over 42 years, which is the period for which the Council are now granting loans to Vestries for electric lighting purposes. The consideration of the scheme was deferred. The Highways Committee reported that the County of London and Brush Electric Lighting Company had asked the Board of Trade to give a definite decision upon the appeals of the Company which were the subject of an inquiry by the Board of Trade in December last. On the 24th of February, they reported that the Board had intimated that they were not prepared to hold that sufficient reasons had been advanced, either on the ground of public safety or of want of parliamentary sanction, to justify them in refusing to approve of a system of supply involving the use of transformer chambers in the public streets; and that the Board hoped this decision on the general question would render unnecessary any further action on the appeals lodged by the Company. The Board afterwards approved a description of the system of supply under the County of London (North) Order, 1892, which contained the following words: "The converting stations will be street-boxes of sufficient size and suitable construction to contain several transformers; room being also provided to enable a man to enter the box and conveniently examine the transformers and controlling apparatus." The Board of Trade had decided to hold a further inquiry into the matter, at which it was thought desirable that the Council should be represented. The Council adopted a recommendation of the Committee that they should be authorized to take all necessary measures for making known at the inquiry their objections to the transformer chambers being placed under the public streets.

In view of the increasing demand for electricity in Leeds, the Directors of the Yorkshire House-to-House Electricity Company, Limited, have decided upon a considerable extension of plant and buildings to meet the anticipated requirements for the winter of 1896. The existing buildings being now quite filled with plant, the Directors are considering plans for a new engine and boiler house, and propose to instal, in the first instance, additional plant of at least 1000 indicated horse power.

The estimate of the cost of the electric works and plant of the Cardiff Corporation was £32,500; but this has been exceeded by £5000. The Borough Engineer recommended the Electric Lighting Committee last Tuesday to borrow an additional sum of £7500 to meet this and other extra expenditure; and this they agreed to do.

At the Portsmouth County Court on the 11th inst., the hearing of the action instituted by the Portsmouth Corporation against Mr. F. Edwards, the landlord of the Wiltshire Lamb public-house, Southsea, to recover £5 for electricity alleged to have been used by him for lighting purposes, as mentioned in the JOURNAL for the 9th inst. (p. 97), was resumed. It may be remembered that the defence was that the meter registering the current was unreliable, and that the consumption recorded by it was not so great as was indicated. The matter was adjourned to allow of expert evidence being called; and this was now adduced. After hearing both parties, the judge favoured the defendant's contention; and he gave judgment for him. The representative of the Corporation (Mr. G. H. King) asked for a further adjournment, in order that he might apply for leave to appeal, as the finding was a serious matter for the Corporation. Mr. Burbidge, for defendant, argued that Mr. King could not appeal on a question of fact; and his Honour concurred—saying he could not see any ground for an appeal. Mr. King could move for a new trial if he pleased.

Last Friday, Mr. F. H. Tulloch inquired into an application to the Local Government Board by the Halifax Corporation for sanction to borrow £10,000 for purposes of electric lighting. A statement was made by the Town Clerk (Mr. K. Walton) to the effect that in 1892 the Corporation obtained a Provisional Order, empowering them to erect works for the supply of electricity. They obtained permission of the Local Government Board to borrow £30,000; but they had since found they would require an additional £4947 to complete the original scheme, and £5000 for extensions. They had actually expended £34,947; whereas the original estimate was only £26,100. In the estimates, the Corporation proposed to utilize some land belonging to them; but, after further consideration, it was decided that a more convenient site should be obtained, which was done at a greater cost than the estimates provided. The amount included in the application for mains and services was only £500; and, as the Committee have decided to extend the mains to Skircoat, the Inspector agreed to this figure being doubled.

Through the medium of the *Manchester Guardian*, Messrs. T. Seymour Mead and Co., Limited, have drawn the attention of the City Councillors to the anomalous charges made for electric lighting as compared with those for gas lighting. They supply the following striking comparison of the cost of gas and electricity for lighting their premises:—

Gas.		*Electric Light.*	
September, 1892	£5 14 3	September, 1894	£22 11 6
December, 1892	16 2 6	December, 1894	34 7 5
March, 1893	18 0 9	March, 1895	37 8 9
June, 1893	5 19 3	June, 1895	24 0 3
	£45 16 9		£118 7 11

The works of the General Electric Company, Limited, of Salford, were destroyed by fire last Friday week. The full strength of the Salford Fire Brigade was in attendance; but, despite the exertions of the men, the works were almost burnt out. The damage is estimated at about £30,000.

METROPOLIS WATER SUPPLY.

Curtailment of the Supply at the East-End.

A short time ago, the East London Water-Works Company apprised their customers that, consequent on the prevailing dry weather on the one hand, and the waste of water on the other, the supply would have to be shut off from some of the service-pipes during a portion of the night. The matter has given rise to much newspaper correspondence and criticism; and the Secretary (Mr. I. A. Crookenden) has, by order of the Directors, issued the following statement:—

"The drought is unprecedented; and the storage reservoirs, which were full at the end of May, having become seriously depleted, the Directors found it necessary to diminish the hours of supply, the more so as the evident waste of water had assumed enormous proportions. About three-fourths of the district supplied was thereupon put upon the intermittent system; but although the hours of service have been materially restricted, the Company are even now pumping upwards of 30 gallons per head per day for all purposes. This should be ample, as it exceeds the quantity distributed by the Manchester, Liverpool, Nottingham, Birmingham, and many other municipal water-works. Even this possible contingency was fully appreciated by the Directors; and as long ago as 1890, they opened negotiations for acquiring upwards of 100 acres of suitable land upon which to construct reservoirs. Having succeeded therein, they promoted a Bill in Parliament for the purpose of greatly enlarging their works and reservoir capacity (1892). The Bill was, however, opposed by the London County Council; and, despite the warning of Mr. Mellor, the Chairman of Committees, who said 'the House would incur the very gravest responsibility if they refused to send the Bill to a Committee,' it was, on a party vote, rejected. In the following year, the Company introduced a similar measure, which was also vigorously opposed by the then Government, but was carried by a majority of one. The provisions in the Bill for increased storage not only commanded the approval of the Royal Commission on Water Supply, and of the Water Examiner (General A. de Courcy Scott, R.E), but when the measure itself was considered by the Committee, they inserted a clause to the effect that the work should be commenced and proceeded with with all possible despatch; and this has been done. Had the Company's first Bill not been rejected in 1893, a very large portion of the work would now have been completed, and could have stored 200 million gallons of water. It has been, all through, a fight between those who are responsible for the supply of water to the East-end of London on the one part, and the London County Council, aided by their friends (who have no responsibility whatever), on the other; and, unfortunately, political considerations, utterly regardless of the needs of the people, and against the solemn protest of the Directors, carried the day. Whatever blame, therefore, has arisen out of the present limited supply of water, is traceable entirely to these influences, which the Company were powerless to resist. With regard to the present supply, there is no fear of any disaster if the people would be but more careful in the use of water. For years it has been wasted to a terrible extent; and although the supply at the present moment has been restricted, the quantity pumped into the district is ample for all legitimate use."

Some startling statistics have been prepared by the officers of the Company, respecting the continued dry weather. From these it appears that the existing drought is unprecedented. The rainfall during the present year has been less than ever before recorded; and much less than during the great drought of two years ago. The average rainfall at seven different stations in the Lea Valley up to the end of last month was 4·6 inches; whereas it should have been 12·5 inches. The Company's storage reservoirs are now practically empty; and all the available sources of supply are used to the utmost. Although an intermittent service is being given, the net quantity supplied per head per day for all purposes is 31 gallons. At the present time, 1600 men are employed in constructing additional storage works; and it will be absolutely impossible to resume the constant supply until there has been a heavy and prolonged rainfall. The water in the Lea has decreased ominously. In May the falling off in one day amounted to 11 million gallons. The waste in the Company's district is lamentable; and while each person is now receiving 31 gallons a day for all purposes, 25 gallons ought to be sufficient. Every drop of water the Company can obtain is being used, and none stored.

Commenting on this subject last Thursday, the *Standard* seemed to impute blame to the Directors of the Company for not taking steps to meet the present emergency. The writer of the article has a sufficient sense of justice to acknowledge that the County Council are responsible for at least a year's delay in the execution of additional storage works—a point which the Directors emphasize in the statement given above. The Company have at their command, as sources of supply, the River Lea, springs, and wells; and, with these three, the writer thinks they ought not to plead, as they do, "that they are utterly unable to meet the wants of the public." But do they plead this? They are sending out, as their Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) states in a letter to that paper, more than 30 gallons of water per head per day, a great deal of which the consumers waste. He explains that the Thames works are capable of furnishing 10 million gallons a day; and practically this quantity was pumped to London during the whole of the frosts, and up to the end of March, as well as during May, June, and July up to the time of writing. In April, the daily average was 5,117,000 gallons. The stand-pipe—nearly 240 feet high—at the Thames works, was seriously damaged in its upper portion by the great gale of Sunday, the 24th of March; and it was, in consequence, impossible to pump the full quantity until the pipe was repaired. This, however, he says, had no effect whatever on the supply to the East London district, as the Walthamstow reservoirs were overflowing during the whole of April, and also until the 26th of May. With reference to the obstructive action of the County Council, Mr. Bryan repeats the Directors' statement, that but for it there would have been additional storage to the extent of 200 million gallons available before this, besides a further supply of three million gallons a day from other sources. In order to show that no delay occurred after parliamentary powers were obtained, Mr. Bryan states that the Royal Assent was given to the Company's Bill on Aug. 17, 1894; and at the first subsequent meeting of the Directors, held on Sept. 6, all the works authorized by the Act were ordered to be proceeded with without delay, and several were actually commenced a week later. The preparation of drawings and details, specifications, and the taking out of quantities for work to cost £200,000, and also the acquisition of certain necessary lands and easements, occupied some time; but, at the break-up of the frosts, the contracts were let to three eminent firms, and were immediately commenced and vigorously proceeded with—there being, at present, 1600 men employed thereon.

The Grand Junction Water Company and the Supply during the Frost.—The Hampton Wick District Council some time ago made a claim of £78 against the Grand Junction Water Company for delivering water to their customers in the district during the severe frost of the past winter; but the Company reduced the claim to £55. The matter has since been considered by their Engineer (Mr. A. Fraser, M.Inst.C.E.), and the Surveyor of the Council (Mr. W. H. Hope), with representatives of that body; and the result is that the Company have agreed to pay the full amount.

The Mourne Water-Works of the Belfast Water Commissioners.—Owing to the death of Mr. A. Gaul, the contractor for No. 3 contract of the Mourne water scheme of the Belfast City and District Water Commissioners—viz., the tunnel and conduit at Carryduff, which form part of the main conduit carrying the supply from the Mourne Mountains to the city—the Commissioners have concluded an agreement with Messrs. Fisher and Lefanu, of Belfast. The amount of the contract is rather in excess of the figure to be paid to Mr. Gaul; but it was the next lowest tender—viz., £140,000.

The Public Lighting of Esher and Ditton.—As some difficulty has arisen in regard to the power of the Esher and Ditton District Council in respect to the lighting of certain parts of the district, a case was submitted to Mr. Macmorran for his opinion thereon. This came before the Council at their meeting on the 9th ult., and was read by the Clerk. He expressed the opinion that the Council could not adopt the Lighting and Watching Act, 1833, for their district, or any part of it. He said the powers of an urban authority under section 163 of the Public Health Act, 1875, could be exercised in respect to the whole or any part of the district without the consent of the ratepayers being first obtained. In reply to the question, "The adoptive Acts being in force in two portions of two parishes, is the Urban District Council able to apply it to the whole district, or must the consent of the ratepayers of the portions of the district where the Act is not adopted be first obtained?" Mr. Macmorran said it seemed to him that the question was founded upon a misapprehension. Upon the constitution of the urban district, the Act of 1833 ceased to apply to those portions of parishes in which it was adopted. The powers of lighting inspectors ceased absolutely; and all funds and properties under their control passed to the new urban authority. The property of the lighting inspectors now belonged to the urban authority; and it was held by them for the entire district, subject to any such adjustment as was provided for by article 7 of the order made by the Council. The present position of affairs was that the urban district authority could continue to light the portions of the parishes hitherto lighted, and might also light any of the parts of their district; and that the expense of so doing would be defrayed out of the general district rates for the entire district, unless, for purposes of lighting, the urban authority divided their district. In reply to other questions, Mr. Macmorran stated that the lighting inspectors, having ceased to exist, had no power at present to make any payment. If they made any payments, the District Auditor would certainly surcharge them. As this case seemed to have been stated under a misapprehension of section 163 of the Public Health Act, 1875, it was possible that difficulties might have arisen by reason of the lighting inspectors having regarded themselves as still possessing some powers under the Act of 1833. If such were the case, he would supplement this opinion, or answer any question arising out of it.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

As intimated in another column of the JOURNAL, the arrangements for the meeting of the North British Association of Gas Managers at Melrose on Thursday are now completed. They have been later than usual in being got into shape, chiefly on account of the difficulty in arranging for the excursion on Friday. The district is rich in places of interest to the pleasure-seeker; and there was a plethora of localities which might have been visited. St. Mary's Loch was thought of; and, I understand, it would have been adopted, but for the fact that there is not accommodation anywhere in the neighbourhood for such a large company, which would prove unfortunate in the case of a wet day occurring. Dryburgh Abbey, the glen, and other places, might have been visited; but the Committee have fallen back upon Abbotsford. Though a short excursion, this, considering it was the home of Sir Walter Scott, who made modern Scotland, is a place of supreme interest to Scotchmen, and not to them only, but to all English-speaking peoples. So much for the pleasure, which it seems a little out of place to put before the business portion of the programme. The technical part, however, speaks for itself. The efforts of Mr. R. S. Carlow, the Secretary, to produce a programme of items sufficiently attractive to draw out members who otherwise might have been content, for the season, with the business pabulum which they received at the meeting of The Gas Institute in Edinburgh, and have remained at home, have been successful. I have no doubt the President's address will be a sound, common-sense production—nothing else could be expected of Mr. Wilson. But the interest of the meeting will centre in the paper by Mr. W. Young, of Peebles. I intended some weeks ago to have informed your readers that Mr. Young had gone for a holiday, which was not altogether undertaken for the ordinary holiday reasons, but which his medical attendant had some say in. But I refrained when I heard that he was busy with a communication for the Association, as some might have thought that a paper written under such circumstances might not be so carefully prepared as is his wont. It is characteristic of the man that, instead of resting, as was the intention of his retirement, he should have devoted himself to the preparation of a paper on a subject which is more than usually technical, even for him. The last two meetings of the Association have been largely devoted to the exposition, by Mr. Young and others, of his oil-gas process. This year he has gone further into the subject, and deals, not so much with the production of gas by any particular process, as with the illustration of the elements and attributes of enrichment. The paper will, in itself, be sufficient to stamp the meeting as one of importance, and one to be remembered. The two following papers—by Mr. Myers, of Saltcoats, and Mr. Vass, of Portobello—will be more of local interest, and will, I have no hesitation in saying, be more helpful to the managers of small works than the more learned dissertation of Mr. Young. They are papers of a sort which no local association should be without. Then the last paper of all—by Mr. Alex. Waddell, of Broughty Ferry—will again introduce the Peebles oil-gas process, which, as all your readers know, is my favourite method of enrichment. It will be a valuable addition to the statistical side of the question of enrichment; and being so, will be of more than local interest.

The accounts of the Paisley Gas Corporation for the past financial year were submitted at a meeting of the Town Council on Thursday night. The gross revenue was £40,815, and the gross expenditure £30,481; leaving a balance of £10,334. From this, there was provided £2342 as interest on mortgages, and £570 as a sinking fund, leaving a surplus of £7421. This is still a progressive record; the net surplus last year having been £4487. The particulars as to output I am unable to give, as they have not yet come to hand; but inasmuch as the price of gas was last year retained at 2s. 8d. per 1000 cubic feet, it is evident that there must have been a very substantial increase. This year, on the recommendation of the Gas Committee, the price has been reduced to 2s. 6d. per 1000 cubic feet. Ex-Bailie Macfarlane, who moved the approval of the accounts, said he would have liked to have made the price 2s. 4d., by which he would have expected to find, at the end of the year, a surplus of £5000; but to keep the Council united, he would move that it should be 2s. 6d. This remark requires explanation; and it is found in the practice of the Corporation in annexing gas surpluses for town improvements. That came out in the remarks of the seconder of the motion, who said that the balances in the Gas Trust had been very useful to the other trusts which had balances on the wrong side. Quite a discussion arose upon this point. One speaker objected to the fixing of the price of gas at a high figure, so as to produce a large surplus for other purposes, as it was "purely indirect taxation;" and he moved that the price of gas should be 2s. 4d. per 1000 cubic feet. Another speaker thought that the other trusts required help; and that it would have been more prudent to have continued the price of gas at 2s. 8d., and so have been able to reduce the debt on the other trusts. Another thought that, as they had no contingent fund, and did not write off anything for depreciation, they should have the price at 2s. 6d., so as to create a contingent fund and have something to help them with future alterations at the works. Provost Mackenzie pointed out that last year they lost £2000 by the miners' strike; and as they did not know what might happen in the current year, he thought they should be content with the reduction to 2s. 6d. In the midst of all this jargon about the appropriation—always a questionable proceeding, or at all events an objectionable one—the view cropped up oftener than once that, taking the quality into account, gas is cheaper in Paisley than anywhere else in Scotland. These, and such like expressions, are common at the meetings of local boards; and I find it difficult at times to hold the scales evenly as between different places. That being so, I give the statement, and only make the remark that my opinion was that the cheapest gas in Scotland was at Hamilton, where the price, for 25-candle gas, is 2s. 1d. per 1000 cubic feet. But whether cheapest or not, Mr. Hislop, the Manager at Paisley, has every reason to be proud of the results he obtains; and the community of Paisley are to be congratulated on the successful working of their gas undertaking. Perhaps I should say—because it is some evidence of enlightenment entering the minds of the Councillors on the subject of the appropriation of the gas surplus—that the policy of uniting the Council was not altogether successful, as the price of 2s. 6d. was only agreed to upon a vote, in which it was carried by seven to four.

It was reported to the Greenock Gas Trust on Tuesday that the revenue for the past financial year was £39,615, and the expenditure £37,456; leaving a net surplus of £2158. The revenue from gas amounted to £33,941, as against £32,690 in the preceding year; while the cost of coal and oil for carbonizing was £13,803—an increase of only £246. The output of gas was 3½ million cubic feet more than in the year preceding. Bailie M'Innes, in submitting the accounts, said that, in view of the advance in the price of oil, he thought it would be wise and prudent for them to watch narrowly the development of circumstances in regard to the price of oil and coal, during, say, the next six months, because, with both systems independent and interchangeable, they occupied a strong position, and were free to choose between the two, or the abandonment of the oil process for a time, if the price of coal should prove temptingly low. They had not yet obtained the full figures; but they inclined to the opinion that the percentage of unaccounted-for gas would be lower, and that the combined coal and oil gas which they supplied during the past six months was more permanent in its character, and better both as regarded illuminating power and volume. Residuals produced at the works realized about £500 less, on account of the fall in the price of sulphate of ammonia, which is now about £4 per ton lower than it was a year ago. He suggested that, as they had estimated to have a revenue surplus of £1500, they should place the amount above that to a contingent fund. The latter proposal was not adopted; Provost Shankland pointing out that the Police Board were responsible for the upkeep of the gas-works, and their Act distinctly stated that the Board "shall apply any surplus to the credit of the Board General Purposes Account." Greenock is another town where the gas profits are appropriated by the Corporation. All the members present agreed in congratulating Bailie M'Innes and his Committee on the satisfactory position of the Trust. The Manager (Mr. S. Stewart) and his staff were also very deservedly complimented on their work.

The report by Mr. Robert S. Carlow, the Manager of the Arbroath Corporation Gas-Works, to the Corporation, on the working of the undertaking during the past financial year, stated that the quantity of coal used was 5044 tons, as against 4629 tons in 1893-94; being an increase of 415 tons, or 8·96 per cent. The make of gas was 49,791,600 cubic feet, against 46,306,100 cubic feet the previous year—an increase of 3,485,500 cubic feet, or 7·53 per cent. The make of gas per ton of coal was 9872 cubic feet, which was a decrease of 132 cubic feet per ton, or 1·32 per cent.; and the gas sold was 8956 cubic feet—a decrease of 169 cubic feet, or 1·85 per cent. The unaccounted-for gas for the year 1893-94 was 8·792 per cent. of the quantity made; and last year it was 9·285 per cent.—an increase of 0·493 per cent. The illuminating power of the gas supplied to consumers during the year averaged 25·57 candles. The number of consumers for the year ending May, 1894, was 4965; while for the past year, it was 4949—a decrease of 16. The financial statement showed that the expenditure for the past year, including annuities and interest on loans, was £10,263 14s. 9d., and the revenue £10,265 17s. 1d.; leaving a balance of £2 2s. 4d. as surplus revenue or profit. The estimates for next year show a balance of £4 8s. 8d. The Finance Committee recommended that meter-rents be abolished, and that the price of gas be continued at 4s. 2d. per 1000 cubic feet. It was proposed that, instead of abolishing meter-rents, the price of gas should be reduced to 4s. 0½d. per 1000 cubic feet; but this was lost by five votes to eight. The accounts were approved. Mr. Carlow has reason to be satisfied with the outcome of the past year's working.

Mr. T. Douglas Hall, the Manager of the Montrose Gas-Works, reported to the shareholders at their annual meeting on Wednesday that there had been an increase in the quantity of coal carbonized, and that 27,329,500 cubic feet of gas had been manufactured—an increase of 855,300 cubic feet compared with the previous year. The quantity of coal carbonized was 2581 tons—an increase of 96 tons upon the preceding year. The average quantity of gas made per ton of coal was 10,620 cubic feet, which was 100 cubic feet less per ton than in the previous year; but the average illuminating power was 25·62 candles, or 0·62 candle higher. Gas unaccounted for amounted to 11·82 per cent., or 1·75 per cent. more than in the previous year. These results, the Chairman explained, were due to the severe weather of the past winter. It is noticeable that other places are similarly affected in the matters of output per ton and unaccounted-for gas. The balance-sheet showed that the income for the year had been £5986, which was a slight increase over last year, and the expenditure £4490; leaving a surplus of £1475. The Directors recommended that out of this surplus a dividend of 5s. 6d. per share be paid, carrying forward about £160. The reports and accounts were approved; and a vote of thanks was accorded to Mr. Hall for his efficient services during the year.

The Stow Gaslight Company have paid a dividend at the rate of 5 per cent. for the past year.

It was reported to the Forfar Gas Corporation, on Monday, that there had been an increase in the output of gas during the past month, compared with the corresponding month last year, of 74,200 cubic feet. The accounts for the year are not yet submitted; but it was stated that it was expected next year the Corporation would be able to sell gas at 3s. 9d. per 1000 cubic feet. Even thus early the good effects of the management of Mr. Waddell, who has not yet been a year in office, are being felt.

Sulphate of ammonia is now selling as low as £9 8s. 9d. per ton for spot delivery.

Cleveland Water Company.—After providing for preferential charges, the Cleveland Water Company have a balance of £3064 on the past half-year's working, which enables the Directors to recommend a dividend at the rate of 7 per cent. per annum on the original and "A" shares, and £4 18s. per cent. on the "B" shares. These, with the addition of £150 to the contingent fund, will absorb £2530, and leave £534 to be carried forward. The dividend proposed is an increase of 5s. per cent. on the "A" shares and 3s. 6d. per cent. on the "B" shares.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 20.

Sulphate of Ammonia.—During the week, the market has been quiet; and very low prices are reported to have been accepted on the East Coast and in Scotland. But at the close there is more disposition to buy—apparently, in great measure, to cover forward speculative contracts, which no doubt leave a nice margin of profit to sellers. Holders of stocks not having come out as sellers, and, consequently, only the actual production being available to fill current requirements, it would seem that the hands of operators are being rather forced, and that they are being obliged to cover their July contracts earlier than they intended. Forward quotations continue to be made by speculators at a moderate premium on prompt prices. The closing spot value at the ports is £9 10s. to £9 12s. 6d. per ton f.o.b.

Nitrate of Soda is unchanged; the spot value of fine quality being 8s. 3d. per cwt.

LONDON, *July* 20.

Tar Products.—The only redeeming feature in this extremely sluggish market is that pitch is inquired for, and that, notwithstanding the hot "summery" weather, considerable shipments are being made. Benzol and solvent show no signs of improvement, although there is an enormous decrease in the production, as is usual at this time of the year. The low price of aniline is undoubtedly extending its use; and it must be in this direction that any relief to benzol can come. Anthracene in second hands is not quite so strong; but the great bulk of the production is in the control of the Products Committee, who are firm in their ideas of value, and apparently sufficiently strong to maintain them. Tar contracts continue to be let at prices which in some cases must leave the distillers a loss; and should anything happen to the high value of pitch, as it may at any moment, the loss on tar distilling at prices being paid will be very serious indeed. Tar distillers, however, are differentiating more than before between the intrinsic values of tar. A wide variation exists in qualities, arising from the various modes of carbonizing at the gas-works. Indeed, some tars are hardly worth distilling at any price—they are so full of carbonaceous matter. Transactions during the week have been noted at the following rates: Tar, 18s. to 21s. Pitch, 35s. to 37s. 6d. Benzols, 90's, 11½d.; 50's, 11d. Solvent naphtha, 1s. 0½d. Toluol, 1s. 0½d. Crude, 30 per cent., naphtha, 4½d. Creosote, liquid, 1⅛d.; ordinary, ¾d.; salts, 18s. Cresylic acid, refined, 1s.; brown, 10½d. Carbolic acid, 60's, 1s. 5½d. Anthracene, nominal, "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia continues dull and lifeless. It is said that considerable stocks are held in London, and that this is the cause of the low values obtaining. Of course, it must not be forgotten that there is an ever-increasing quantity of sulphate coming from coke-ovens. But it should also be remembered that the production of sulphate of ammonia is a small thing compared with the output of nitrate of soda; and, after all, the nitrogen value must regulate the price of sulphate. Business has been done during the week at prices ranging from £9 7s. 6d. to £9 12s. 6d., less 3½ per cent. discount. Gas liquor is offered at 7s. to 8s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The political contests in the various mining and manufacturing districts of Lancashire during the past week have necessarily considerably interfered with operations; and the position of the coal trade generally remains practically unchanged. There is nothing further to note with regard to gas-coal contracts; whilst in other descriptions of round coal, business remains extremely depressed. Three days per week represents the full average that pits are working; and supplies even with this restricted output are in excess of requirements. Nominally, the better qualities of round coal, except in special cases, have been held at late rates; but the commoner descriptions continue to tend steadily downwards, owing to the keen competition from outside districts. At the pit mouth, quotations may be given at about 10s. up to 10s. 6d. per ton for best Wigan Arley; 8s. 6d. to 9s., for Pemberton four-feet and seconds Arley; 7s. 6d. to 8s., for common house coal; 7s., for partially screened Arley gas coal; 6s. 6d., for Wigan four-feet screened gas coal; and about 6s., for steam and forge coals, with, however, as low as 5s. 6d. being taken for shipment. The colliery proprietors have no difficulty in moving away their small output of engine fuel; but the considerable stocks of slack still held at many of the collieries keep down prices. At the pit mouth, common qualities of slack do not average more than 3s. 6d. per ton, with the better qualities quoted at 4s. 6d. to 5s.

Northern Coal Trade.—The coal trade is steadier generally; and there is a stronger demand for gas coals especially. Best Northumbrian steam coals are firm at from 8s. 9d. to 9s. per ton f.o.b.; while second-class qualities are scarcely so steady, and vary from 8s. to 8s. 6d. per ton. Steam smalls are steady at 3s. 3d. to 3s. 9d. per ton, according to quality and position of colliery. Manufacturing coals are rather dull, but the consumption at some of the shipbuilding yards is increasing, though the range of prices shows no important alteration. Gas coals are in a little better demand; but there is no full working generally at the collieries yet. One or two pits which ship a large part of their output, are well occupied; but most of the gas-coal collieries are working short time, and it is probable that two months will elapse before there is an adequate use of the facilities. The price varies from 6s. to 7s. per ton f.o.b.; and recent contracts have been perhaps a little above the minimum rate of a few months ago. Deliveries on the new contracts are slightly larger than they were, and may be expected to rise more rapidly in the course of the next few weeks. There is a larger shipment of smithy coals; but in other classes, the variation is not important. Coke is steady; the local demand being rather larger, though the exports continue limited. The price is still from about 12s. 6d. to 13s. 6d. per ton f.o.b., according to quality. Gas coke is in low production, which is well taken up, at the old prices.

Scotch Coal Trade.—On account of the Glasgow fair holidays, there is no quotation relating to the Scotch coal trade for last week; but it is immaterial, because the business doing was very limited. The shipments are reported as having amounted to 159,970 tons—a decrease as compared with the preceding week of 11,144 tons, but an increase on the corresponding week of last year of 139,580 tons. For the year to date, the total shipments have been 3,616,529 tons—a decrease as compared with the same period of last year of 24,361 tons.

Taunton Gaslight Company.—The general cash account of this Company for the year ending June 30 shows that, including a balance of £4059 brought forward, the receipts amount to £19,344. The expenditure totalled to £13,900. A sum of £1727 has been expended on renewals and repairs; and it is noticed that, among other items, £1438 was paid away in wages and "bonuses," and £4554 for coal. The £13,900 also embraces £2723 for dividends, and £1109 for discounts to private consumers. The balance on this account is £5444. Including this sum, assets are shown to the amount of £8732. Deducting liabilities, there remains £4748. Adding to this sum, the stocks of fire goods, pipes, tools, &c., the furniture, and a balance of £3558 due from capital, account, makes the total assets £9518. The quantity of gas sent out during the twelvemonth was 64,114,800 cubic feet. The dividends recommended are 8 per cent. on the consolidated "A" stock, and 7 per cent. on the 1872 issue shares; and a further dividend of 1 per cent. on the "A" stock for the year 1890, when 7 per cent. only was declared. The Directors have reduced the price of gas 3d. per 1000 cubic feet, dating from June 15 last.

Thirlmere Water for Halton.—The Lunesdale Board of Guardians have had frequent discussions upon the question of a supply of water for Halton; and they have been wavering between two schemes. By one it was proposed to provide a supply from Caton, and by the other to take a supply from the Thirlmere pipe-line of the Manchester Corporation. By nine votes to eight, it was decided on the 8th inst. to adopt the latter scheme. Mr. Lee Booker, who had been to Manchester and Kendal in order to clear up certain facts as to the Thirlmere supply, said it was a matter of indifference to Manchester whether or not they furnished water to other places. They were, however, willing to supply water on the terms specified in the Act; the price to be calculated upon the expenditure incurred and the quantity of water conveyed. The amount of capital outlay had not yet been ascertained, as the work was not completed; but the cost of laying both lines of pipes had been estimated at £3,500,000. It was calculated that, when the first line of pipes was finished, the price that would be charged would be 10·1d. per 1000 gallons; but at the expiration of five years, when the second line of pipes would be completed, the price would drop to 5·83d. Mr. Booker gave a lengthy statistical statement, on the basis of the information supplied him at Manchester, showing that while the cost of the Caton scheme would be £4850, that of Thirlmere would only be £4341, so that the latter was not only unlimited in amount, but was actually cheaper.

The Barnsley Water Bill and Lead-Poisoning.—The Law and Parliamentary Committee of the West Riding County Council, in a report submitted last Wednesday week, dealt at considerable length with the Barnsley Corporation Water Bill. The County Council petitioned against the Bill with a view to its amendment on several points, one of which was to obtain safeguards in the Bill, obliging the Corporation to deal with the water so as to prevent lead-poisoning. The *locus standi* of the County Council was disallowed by the Lords' Committee; but the following clause was prepared and forms part of the Bill: "All water supplied by the Corporation shall be properly and thoroughly filtered, so as to remove its deleterious action on lead." This clause, the Committee remark, is a great gain as an innovation, and satisfies the main part of the principle contended for by the County Council—*i.e.*, the treatment of the water in such a way as to deprive it of its injurious action on lead. "To this extent," the report continues, "the opposition has its justification. But the mere creation of a new duty not enforceable in some summary manner may lead to the neglect which frequently arises where it is everyone's right to take action. The clause should be amended by requiring that the process of rendering the water proof against lead should be continuously applied to the satisfaction of a supervising authority—*e.g.*, the Local Government Board—who should have the right to sue for a penalty in case the treatment is inefficient." The Committee are of opinion that the opposition to the Bill should be persisted in for the continuous discharge of compensation water and in relation to lead-poisoning.

Salisbury Corporation Water Supply.—The Borough Surveyor of Salisbury has suggested to the Corporation Water Committee that, the additional engine, boiler, and pumps being completed, and the yield of water increased by the deep boring which has been made in the new well, the time has arrived when a constant supply of water should be given to the town. Recently the old machinery has been at work 22½ hours per day, supplying 720,000 gallons, or 45 gallons per head for all purposes to a population of 16,000; and this supply was not so satisfactory as it should have been—part of the district not being included, and the pressure in portions of the city being insufficient. The new engine, &c., will be able to supply the same quantity of water in 10½ hours. The waste of water in the borough is very heavy; and special observations and reports on the subject have been made by the Surveyor, with the result that the Committee have ordered a systematic house-to-house inspection. The reports were presented to the City Council, at their last meeting, by Mr. Haskins, who drew attention to the fact that the powerful engines they now had were capable of raising within 24 hours close upon a million gallons of water, equal to 68⅓ gallons per head of the population. With reference to the waste of water, he said the service-pipes in the city had been laid down thirty or forty years; the oldest of them being black iron pipes, which were really meant to last only about ten or twelve years. These pipes were now full of holes; and they leaked when the old engine was worked and the pressure was not great, while, directly they attempted greater pressure with the new machinery, the waste was increased to an enormous extent. The Committee recommended a house-to-house inspection, beginning with Winchester Street, where the consumption per head was 85½ gallons, whereas the average for the town was 64½ gallons. The reports were adopted.

Exhibition of Gas Appliances.—Messrs. W. Parkinson and Co. held a gas exhibition from Monday to Wednesday last week in the Crown Hall, South Petherton; Miss Edith Sanderson giving practical demonstrations on cookery twice daily.

Electric v. Incandescent Gas Lighting for the Victoria Embankment.—In our "Electric Lighting Notes" to-day, reference is made to the scheme submitted by the Highways Committee of the London County Council for lighting Victoria Embankment and Waterloo and Westminster Bridges by electricity. The consideration of the scheme has been adjourned; and it seems as though some opposition would be offered to it. Mr. Thornton has given notice of an amendment to the effect that the Committee be instructed to obtain reports from the Engineer and the Chemist upon the question whether the present lighting could be improved by the substitution of incandescent burners for those in use. Mr. E. White has also expressed his intention of moving that the Committee's recommendation be referred back to them, with instructions to ascertain and report what is the cost of the present lighting, and what would be the cost of incandescent gas lighting and of electricity supplied by a company.

Downton Public Lighting.—At a public meeting of the electors of the portion of the parish of Downton, coincident in area with the ecclesiastical parish of St. Lawrence, recently held to consider the advisability of adopting for any part of that area the provisions of the Lighting and Watching Act, a statement was made by the Secretary of the Lighting Committee (Mr. Dunmore) to the effect that there had been 33 lamps in use, two of which were private property, and that the annual cost of lighting had averaged £28. There was, he said, a deficiency of £3 17s. 6d.; and the Committee, thinking the work should properly come under the Parish Council, had decided to discontinue their functions. It was agreed to adopt the Act for lighting purposes; the area to be the ecclesiastical parish of St. Lawrence. It was also decided that the amount to be expended should not exceed £35 for the first year; and the Parish Council will take over the Committee's plant for the sum now representing the deficiency in their account.

The Tradeston Gasholder Tank Dispute.—It may be remembered that a short time ago a dispute arose between the Contractors for the large gasholder tank at the Tradeston Gas-Works (Messrs. J. Paterson and Son, Limited) and the Glasgow Gas Commissioners as to their right to payment for the cartage and stacking of earth removed in the course of the work. The contract price for excavating the tank was 1s. 1d. per cubic yard; but the Contractors claimed 4s. 4d. per cubic yard for all the material they had to deposit temporarily elsewhere, and then bring back to the tank to be used in filling and embanking, owing to there being insufficient space upon the ground. The dispute was submitted to the arbitrament of Mr. W. Robertson Copland, of Glasgow, who decided that the contract does not imply a warranty on the part of the Commissioners to provide sufficient area for laying aside the material to be excavated, until it might be again required for use. The Contractors alleged that the extra cost for ground would amount to £1500 or £2000; but this part of the case did not receive serious consideration from the Arbiter.

The Expenses of the Litigation between the Alliance Gas Company and the Dublin Corporation.—At the meeting of the Dublin Corporation on Monday last week, Mr. Beardwood moved—"That the Law Agent be instructed to furnish to the Council, by the first meeting in September, a statement showing the expenses incurred by the Corporation in law proceedings with the Gas Company, from May 7, 1888, to the present time, both in actions brought by the Company against the Corporation, and by the Corporation against the Company, as well as the costs of the arbitration in connection with the lamps and gas plant." He said his reason for making the motion was that he thought the time had come when the Corporation should arrive at some means of dealing with the Gas Company. They had been engaged in continuous litigation with the Company, and had been always beaten. The Lord Mayor remarked that the Corporation, on the contrary, had succeeded, except in one case, where there was still a question of appealing. Alderman Pile seconded the motion. The Lord Mayor said there would probably be no objection to the information asked for being given; and the public would find that the expenses had not been at all as great as was believed by some people. Sir R. Sexton thought the request of Mr. Beardwood was perfectly reasonable. It was eventually agreed that the information desired should be obtained from the City Accountant; and that the Gas Committee should report to the Council on the matter.

New Workshops for the Liverpool Corporation Water Committee.—The Liverpool Corporation have erected for the Water Department new central workshops and stores in Pall Mall, to take the place of the three establishments which have been used for those purposes, and which are historically of some interest. The Liverpool and Harrington Water Company, which was incorporated at the beginning of the present century, sank several wells in the city, from which they pumped water for the use of the inhabitants. One of these wells was situated in Hotham Street; and adjoining the engine-house, offices and workshops were erected. The Chief Water Engineer continued to occupy these offices until the construction of the Municipal Buildings; and since then, as before, the workshops have remained in use. In addition, the Corporation possess in Bevington Bush and William Henry Street, Soho, two more of the pumping-stations built by the old Company, both of which have, in recent years, been utilized as workshops and for storage purposes. The accommodation at these three places has been found to be totally inadequate, and altogether unsuited to modern requirements. They have therefore been closed; and the stores and workshops all brought to one common centre in Pall Mall. On the upper floor of the new building, there has been provided a standard sample room, wherein standard samples will be deposited of all articles which, under Corporation contracts, are required to be in accordance with an approved sample. To the right of the main entrance is the office for testing water-fittings. The total number of fittings tested annually is about 80,000. Immediately above the fittings testing shop is a standard sample room, in which the public may inspect approved samples of fittings, which have been adopted by the Corporation. A workman's dining-room and hot-water heating system have also been provided.

The Public Lighting of Tunstall.—At last Wednesday's meeting of the Tunstall District Council, it was resolved to renew the contract with the British Gaslight Company for the public lighting, on the same terms as before, for one year.

Oil Gas Enrichment Company, Limited.—The second annual general meeting of this Company is to be held next Monday in Edinburgh. In the report to be presented, it is stated that the balance at the credit of the profit and loss account for the twelve months ending June 30 last is £275, from which £250 has to be deducted to meet the fixed dividend of 5 per cent. on the preference shares—leaving a balance of £25. During the year, expenses to the amount of £547 were incurred in connection with the development of the Peebles process and patents; and the Directors have deemed it advisable to write off the whole of the sum against this year's profits, instead of spreading it over a series of years. They state that the process continues to give satisfactory results; and they record with pleasure that enrichment by oil gas stood most satisfactorily the test it had to undergo in the past severe winter.

The Coal Contracts of the Leeds Corporation.—Some 160 tenders have been sent in for the supply of coal to the Leeds Corporation Gas-Works for the ensuing twelve months. The tenders for ordinary coal averaged from 9d. to 1s. a ton less than was paid last year; and the Committee have decided to buy about 270,000 tons. Cannel coal proportionately was quoted even lower; and of this class the Committee let contracts for the supply of about 30,000 tons. At present the stock of coal at the different gas-works amounts, in round figures, to 20,000 tons; and there is yet upwards of 30,000 tons to be delivered on the old contracts. The annual consumption at the gas-works is about 270,000 tons. Therefore the Committee, when the new quantities have been supplied, will have about 80,000 tons more than will be required. It is the exceptionally low prices quoted that have induced the Committee to stock a supply. It is intimated that, owing to the improvements at present going on at the different works, a reduction in the price of gas to the consumers cannot be expected, at any rate within the next six months.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 175.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	22 - 23	..	4 11 4
100,000	10	,,	7½	Do. 7 p. c.	10	15—16	..	4 13 1
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	104—106	..	4 14 4
200,000	5	10 May	6½	Bombay, Limited	5	7—7½	+¼	4 6 8
40,000	5	,,	6½	Do. New	4	5—5¼	..	4 14 7
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	255—260	+5	4 8 6
180,000	,,	,,	8½	Do. New	100	205—210	+5	4 0 11
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	220—225	..	4 17 9
888,500	Stck.	28 Feb.	5	Bristol	100	122—125	..	4 0 0
320,000	20	28 Mar.	11¾	British	20	53—55	+½	4 1 10
50,000	10	14 Mar.	11½	Bromley, Ordinary 10 p. c.	10	22—23	..	5 0 0
51,510	10	,,	8½	Do. 7 p. c.	10	17—18	..	4 14 5
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	7¼—8	..	5 0 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	99—102	..	5 17 8
150,000	20	11 July	8½	Cagliari, Limited	20	28—30*	+2½	5 10 0
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	299—304	+7	4 8 9
165,000	,,	,,	10½	Do. New o.	100	225—230	..	4 11 4
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143—147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	260—270	+7½	4 16 3
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	203—208	..	4 16 2
535,000	Stck.	28 Feb.	5¼	Crystal Palace Ord. 5 p. c. Stk	100	125—130	..	4 0 9
486,090	10	31 Jan.	11	European, Limited	10	25—26	+½	4 4 7
351,060	10	,,	11	Do. Partly pa d	7½	17—18	..	4 11 9
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	285—290	+3	4 2 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105—110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c.Pf.	100	280—285	..	3 10 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197—202	..	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	190—195	..	3 11 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	277—282	..	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	165—170	..	3 10 7
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	130—133	..	3 0 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140—145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	198—202	..	2 19 4
3,800,000	Stck.	10 May	12	Imperial Continental	100	250—254	+2	4 14 5
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	5¼—6¼	+¼	4 16 0
560,000	100	1 Apl.	5	Met.of Melbourne, 5 p.c. Deb.	100	115—117	..	4 5 6
541,920	20	12 June	5	Monte Video, Limited	20	16—17	..	5 17 8
150,000	5	24 May	8	Oriental, Limited	5	7—7¼	..	5 6 8
60,000	5	28 Mar.	7	Ottoman, Limited	5	4¼—5¼	..	6 13 4
166,870	10	14 Feb.	2	Para, Limited	10	1¼—2½	..	8 0 0
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102—106	..	5 13 2
500,000	100	4 June	6	2nd Do.	100	100—105	..	5 14 3
150,000	10	26 Apl.	7	San Paulo, Limited	10	9¾—10½	+½	6 13 4
500,000	Stck.	14 Feb.	15½	South Metropolitan, A Stock	100	355—365	..	4 4 11
1,350,000	,,	,,	12	Do. B do.	100	302—307	..	3 18 2
290,000	,,	,,	13	Do. C do.	100	307—312	..	4 3 4
775,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	172-176*	..	2 16 10
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230—235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	290—295	..	3 7 10
1,719,514	Stck.	10 Apl.	8	East London, Ordinary	100	233—238	−2	3 7 3
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	155—160	..	2 16 3
700,000	50	26 June	7	Grand Junction	50	113—117	..	2 19 10
708,000	Stck.	14 Feb.	12	Kent	100	307—312	..	3 16 11
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	260—264	+1½	2 16 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	208—213	+1	3 10 5
330,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	145—150	..	2 13 4
500,000	100	14 Feb.	12¾	New River, New Shares	100	385—395	+10	3 4 6
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk.	100	145—150	..	2 13 4
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	157—163	..	2 9 1
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140—145	+5	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	288—293	..	3 8 3
						*Ex div.		

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PATENT GAS EXHAUSTERS AND ENGINES.

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HYDRAULIC AND GAS ENGINEERS,

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Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

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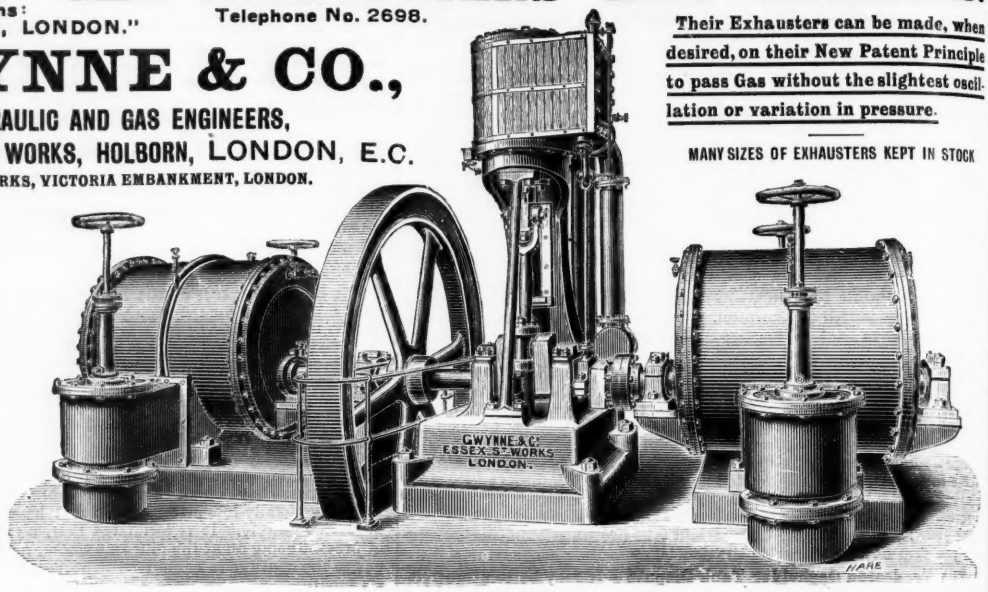

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Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

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THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.
*** See Advertisement p. II., centre of JOURNAL.
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SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
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Apply to GIBBONS BROS., LIMITED, DUDLEY; E. MASTERS, Bow Common Gas-Works, LONDON, E.; or R. MASTERS, Wavertree Gas-Works, LIVERPOOL.

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Sample and Price on application.
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Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

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PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
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THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
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STEPHEN CARPENTER, of the Bow Common Gas-Works, on the Purification of Coal Gas by Lime, Oxide of Iron, and Atmospheric Air, and the Method of Working Purifiers so that the Lime may be used a second time, with a description of Carpenter's short Method of working off the Sulphur Test and Table for calculating Results.
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WANTED, by a Manager's Son, a Situation as MANAGER of Small Works, or as WORKING FOREMAN. Thoroughly experienced in Carbonizing, Main and Service Laying, Inside Fitting for Slot Meters, Gas-Stoves, and the Working of Small Works. First-class Testimonials.
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WANTED MANAGER.

A SCOTTISH Manager, who has for Fourteen Years had entire charge of a Gas-Works for me on a French Island, is desirous of a change to England or the Continent; and, in his interest solely, I wish to assist him in this object.

He has produced the largest amount of Gas per Ton of Coal of any of my Managers. He has produced a satisfactory Dividend; while, before he took charge, I had not for Ten Years received the value of a farthing. The price of Gas has been several times reduced; and the consumption has doubled. He has had sole charge of Cash; and I will guarantee him to the amount of £1000. He is 40 years of age; married; and most attentive to business. I have given him a long holiday; sending a gentleman to temporarily or permanently succeed him.

He can be seen here during the whole of August.

GEORGE ANDERSON.

35A, Great George Street,
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WANTED, an efficient Man as Main and SERVICE LAYER and SMITH. Only those with First-class References need apply. Permanent Situation.

Applications, stating Age and Wages, to be forwarded not later than Monday, July 29, to Mr. J. MARSLAND Manager, Gas-Works, SOWERBY BRIDGE.

GRANTHAM GAS COMPANY.

THE Directors invite applications for the post of MANAGER. Must be experienced in Carbonizing, efficient in the control of Men, and with a good knowledge of Book-keeping.

Salary £300 a year, with good Residence and Garden, Rates, Gas, and Coal free.

Applications, stating age, accompanied by recent Testimonials (not more than three in number), to be sent in, addressed to the Chairman of the Company, not later than Tuesday, the 23rd of July, 1895.

MERTHYR TYDFIL GAS COMPANY.

WANTED, an active and efficient COLLECTOR of the Gas-Rents and other Accounts of this Company. Persons who have been already employed in similar duties, and possessing a knowledge of the routine of a Gas Office, preferred.

Candidates must not exceed 35 years of age.

Approved security for faithful services will be required.

Salary, £110 per annum.

Applications, stating Age, Experience, if Married or Single, and giving full particulars of past and present Engagements, accompanied by *copies only* of not more than three recent Testimonials of general character, to be addressed to the undersigned not later than Saturday, the 27th inst.

By order of the Directors,
JOHN LEES COCKER,
Manager and Secretary.

Gas Offices, Gas-Works, Merthyr Tydfil,
Glamorganshire, July 10, 1895.

WANTED, Spent Oxide for prompt delivery, any quantity, containing not less than 50 per cent. Sulphur.

Apply J. HARDMAN, Milton, STAFFS.

OSWALDTWISTLE URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the TAR and LIQUOR produced at their Works for One Year from the 31st day of July, 1895.

The quantity of Coal carbonized is about 3500 Tons.

Further Particulars may be obtained from the Manager, Gas-Works, Church, near Accrington.

Tenders, endorsed "Tender for Tar," to be addressed to me, and to be delivered not later than Wednesday, the 31st of July.

WM. SANDEMAN,
Clerk.

District Council Offices,
Oswaldtwistle, June 26, 1895.

BROADSTAIRS GAS COMPANY.

THE Directors of the above-named Company invite TENDERS for the supply of 3000 Tons of good screened GAS COAL per annum (for One, Two, or Three Years), delivered at Broadstairs Station, or into Carts at Broadstairs Harbour, in such quantities as the Manager may require from time to time.

Tenders to be sent in not later than Tuesday, the 6th day of August, 1895, addressed to the Chairman of the Company.

The Directors do not bind themselves to accept the lowest or any tender.

Full Particulars can be obtained on application to the undersigned.

W. J. LATCHFORD,
Secretary and Manager.

Broadstairs, July 13, 1895.

BOROUGH OF WIDNES.

THE Widnes Corporation have the following MACHINERY to offer FOR SALE: One GASHOLDER, 36,000 cubic feet capacity; One ANNULAR CONDENSER, 12-inch Connections; One LIVESEY WASHER, capacity 750,000 cubic feet per diem; One 12-inch GOVERNOR; One ENGINE and EXHAUSTER (Anderson), capacity 22,000 cubic feet per hour; FELDMANN'S SULPHATE OF AMMONIA STILLS; One CAMERON ENGINE, with detached Well Pumps, at Stocks Well Pumping-Station; and One ENGINE and PUMPS at Netherley Pumping-Station.

Particulars may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.

Tenders, endorsed "Tender for Machinery," to be delivered to the undersigned not later than the 5th of August prox.

The Corporation do not bind themselves to accept the highest or any tender.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
July 18, 1895.

STRATFORD-ON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 4000 Tons of best quality of GAS COALS.

Forms of Tender and full Particulars may be obtained of

J. S. CRANMER,
Manager.

July, 1895.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the Corporation of Lincoln are prepared to receive TENDERS for the purchase of the surplus TAR (about 800 Tons) produced at their Works during the period of One Year, commencing on the 1st of July, 1895.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Residuals," must be delivered at the Gas Offices, Lincoln, on or before the 29th inst.

The Committee do not bind themselves to accept the highest or any tender.

Other Particulars may be obtained of the undersigned.

JNO. CARTER,
Manager.

Gas-Works, Lincoln,
July 6, 1895.

MALTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Malton Gas Com- pany are prepared to receive TENDERS for the supply of unscreened GAS COAL or NUTS (about 4000 Tons per annum) for One, Two, or Three Years ending June 30.

Delivery to be made at the N.E. Railway Company's depôt, or by Boat at the Gas-Works on the River Derwent.

Particulars and Forms of Tender can be obtained on application to the undersigned.

Tenders, endorsed "Tender for Coal," to be addressed to the Chairman, and delivered not later than Friday, the 2nd of August next.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
HENRY TOBEY,
Secretary.

Gas-Works, Malton,
July 20, 1895.

BOROUGH OF BRIGHOUSE.

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of about 4000 Tons of GAS COAL required at their Rastrick Gas-Works, Bird Royd, from Aug. 1, 1895, to June 30, 1896.

Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Public Offices, Brighouse.

Sealed tenders, stating price per ton delivered at the Gas-Works, or alongside Gas-Works by the Calder and Hebble Canal, or at Brighouse Railway Station, must be sent in on or before Wednesday, the 31st day of July, 1895, addressed to the Town Clerk, Public Offices, Brighouse, endorsed on the outside "Tender for Coal."

The lowest or any tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Public Offices, Brighouse,
July 10, 1895.

OLDBURY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of this Council are open to receive TENDERS for the supply of 8000 Tons, or thereabouts, of screened GAS COAL for delivery during the Year ending the 31st of August, 1896, in such quantities and at such times as ordered, carriage free, at the (1) Oldbury Basin, G.W.R., or (2) L. & N.W. Railway, Oldbury.

The Coal must be of First-class quality, well screened, freshly wrought, and as free as possible from Bats, Pyrites, and other foreign matter.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Coal," must be delivered to the undersigned not later than Saturday, Aug. 10 next.

The Gas Committee do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

Tender Forms and any other Information may be obtained from the undersigned on application in writing.

By order,
A. COOKE,
General Manager.

Gas-Works, Oldbury,
July 20, 1895.

SOUND INVESTMENTS.

MESSRS. JOHN LEES & BURCHELL are instructed to SELL BY AUCTION at Laker's Hotel, Redhill, on Wednesday, the 31st of July, at Seven o'clock precisely, the following STOCKS and SHARES, which are receiving, with one exception, Dividends of upwards of 10 per cent.—

100 SHARES of £5 each, fully-paid, and 65 SHARES of £5 each, £3 10s. paid, in the REDHILL GAS COMPANY.

£275 CONSOLIDATED STOCK in the MAIDSTONE GAS COMPANY.

£240 CONSOLIDATED ORDINARY STOCK in the TUNBRIDGE WELLS GAS COMPANY.

10 "B" SHARES of £10 each, fully-paid, in the EASTBOURNE GAS COMPANY.

Particulars of Messrs. JOHN LEES AND BURCHELL, Auctioneers and Land Agents, REIGATE, and Wool Exchange, COLEMAN STREET, E.C.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Proprietors of the above Company will be held at the Company's Offices, North Street, Wandsworth, on Thursday, the 8th of August next, at Five o'clock in the Evening precisely, for the purpose of a declaration of a Dividend, and the transaction of the General Business of the Company.

The Transfer Books will be closed on and from the 26th of July, till the 8th of August, both days inclusive.

By order,
W. CROMARTY,
Secretary.

Offices: North Street, Wandsworth,
July 18, 1895.

SOUTHWARK AND VAUXHALL WATER COMPANY.

SALE, BY TENDER, OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Southwark and Vauxhall Water Company to SELL BY TENDER, to be received at the Company's Office, Southwark Bridge Road, S.E., not later than Twelve o'clock Noon on Tuesday, July 30, 1895, such amount of Four per Cent. Debenture Stock as will produce (including premiums thereon) £83,231.

The Stock now for sale is the balance of the sum of £300,000 of Debenture Stock authorized to be raised by the Southwark and Vauxhall Water Act, 1891, and will be entitled, from the 30th of September, 1895, to Interest at the rate of 4 per cent. per annum. It will be consolidated with the whole of the Company's existing Debenture Stock, and will be known as Debenture Stock "A" under the Provisions of the Southwark and Vauxhall Water Act, 1894. It will rank before the whole of the Company's authorized Stock and Share Capital, now amounting to £1,518,000, the whole of which is paid up, and the Interest thereon will have priority of payment over all Dividends or Interest on such Capital, and will rank *pari passu* with the Interest on all the Company's existing Debenture Stock.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Southwark Bridge Road, S.E.

By order of the Board of Directors,
ALFRED JELLEY,
Secretary.

Southwark Bridge Road, S.E.,
July 9, 1895.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

> "The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

> "The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held, at this Office, on Friday, the 2nd day of August next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 17, 1895.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices, No. 63, Chancery Lane, in the County of Middlesex, on Friday, the 9th day of August, 1895, at Four o'clock in the Afternoon precisely, to receive a Report from the Directors, declare Dividends, and transact the Ordinary Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED on the 26th inst., until after the General Meeting.

S. J. WILLIAMS,
Secretary.

Offices: 63, Chancery Lane,
London, W.C., July 23, 1895.

BY ORDER OF EXECUTORS AND OTHERS.

GAS AND WATER SHARES AND STOCKS.

MR. ALFRED RICHARDS will Sell by AUCTION at the Mart, E.C., on Tuesday, July 30, at Two, in Lots, 61 £10 fully-paid SHARES in the UXBRIDGE and HILLINGDON GAS CONSUMERS' COMPANY; also £352 MORTGAGE DEBENTURE BONDS in the SOUTH-WEST SUBURBAN WATER COMPANY, LIMITED.

Particulars of Messrs. HORSLEY AND WEIGHTMAN, Solicitors, 1, GUILDHALL CHAMBERS, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 14th day of August next, at Two o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last, to declare a Dividend, and to elect an Auditor in the place of Mr. Arthur Footner, deceased. Any Proprietor intending to become a Candidate must give notice, in writing, at the Office of the Company, at least fourteen days previously to the day of Election. He must have been a Shareholder for the space of Six Calendar Months, and possess, at the time of his Election, Stock of the nominal value of £1000.

The TRANSFER BOOKS WILL BE CLOSED from the 31st day of July until after the meeting.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.,
July 22, 1895.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY, LIMITED,

GUARANTEES FIDELITY.

Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.

HEAD OFFICE:

49, CHANCERY LANE, LONDON, W.C.

INCANDESCENT MATERIALS

OF THE VERY BEST QUALITY FOR

Lighting Power and Burning Permanence.

Recommended to Wholesale Buyers.

In any Quantity at the Lowest Prices.

Supplied by the

INTERNATIONALE GLÜHKÖRPER COMPAGNIE,

ARNHEIM, HOLLAND.

WRITE FOR SAMPLES.

"BEAR CREEK" CANNEL.

LOG MOUNTAIN COAL, COKE, AND TIMBER CO.,
PINEVILLE, KENTUCKY, U.S.A.
Cable Address: "Hull, Pineville."

LONDON AGENTS:
W. J. WILSON & Co., Suffolk House, Cannon St., E.C.

GAS PURIFICATION.

Best Absorbent of Sulphuretted Hydrogen, &c.

JAMES E. CAMPBELL,
Patentee and Manufacturer,
96, MILL STREET, BRADFORD, MANCHESTER.

PRICES, &C., ON APPLICATION.

ACTIEN-GESELLSCHAFT
FÜR CHEMISCHE INDUSTRIE,
MANNHEIM, GERMANY.

Manufacturers of

Acetylene

Liquefied
(C_2 H_2)
in Steel Cylinders.

Write for Particulars.

CLOTH CASES
FOR
BINDING SUBSCRIBERS' VOLUMES OF THE "JOURNAL"
CAN BE HAD OF THE PUBLISHER. **Price 2s. each.**

SELF-SEALING MOUTHPIECES

Made strong for Horizontal and Inclined Retorts in Round, Oval, and ⌂ shapes, and to open at Right Angles for Machine Work. Faced in Ruscoe's Patented Machines; thus ensuring correct and smooth joints when closed.

TESTIMONIALS.

Sheffield United Gaslight Company, Commercial Street, Sheffield, 11th April, 1895.

DEAR SIR,—In reply to your enquiry, I have pleasure in saying that we have a number of your Retort Mouthpieces at work, and that they give perfect satisfaction.

Yours faithfully,
FLETCHER W. STEVENSON,
Engineer.

Mr. JOHN RUSCOE.

Leigh Urban District Council, Gas & Water Departments, Leigh, Lancs., April 11th, 1895.

DEAR SIR,—In reply to yours of yesterday, I have pleasure in testifying that the Retort Mouthpieces which you supplied to the Leigh Gas-Works seven years ago have given every satisfaction. We have now 267 of the Mouthpieces erected, and hitherto none have required refacing.

Yours faithfully,
A. T. FLETCHER.

Mr. J. RUSCOE, Albion Works, Hyde.

FOR PARTICULARS APPLY TO **JOHN RUSCOE, ALBION WORKS, HYDE.**

Telegraphic Address: "Robustness, London." Telephone No. 1756.

J. & H. ROBUS,

ENGINEERS & CONTRACTORS FOR GAS & WATER WORKS,
20, Bucklersbury, London, E.C.

RETORT-SETTING & Gaseous Firing a Speciality.

MAIN LAYING,

AND THE ERECTION OF GAS AND WATER PLANT OF EVERY DESCRIPTION,
INCLUDING SINKING WELLS AND BOREHOLES.

GASHOLDER TANKS.

Established 20 Years.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

HUNTER'S
OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
11, BAY STREET, PORT GLASGOW.
Telegrams: "HUNTER, PORT GLASGOW."
Established 1872.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.
IRONFOUNDERS,
MIDDLESBROUGH.

AUSTRALIAN BOGHEAD.

Practical Results in Ordinary Working:—

Gas per Ton . . . 15,100 Cub. Ft.
Illuminating Power . 45·6 Candles.

For Samples and Prices, f.o.b. London or c.i.f. to Continental Ports, apply to
THOMAS RAISON & Co.,
117, LEADENHALL STREET, E.C.

ECONOMIZE £16 per RETORT per ANNUM by the USE of RETORTS of REDUCED THICKNESS fitted with

GUEGUEN'S
COMPENSATING
HELICOIDAL RIBS.

NO OUTLAY OF CAPITAL.
NO ALTERATION IN SETTINGS.
APPLICABLE TO ALL RETORTS

J. LANS,
Engineer,
10, MOORGATE STREET,
LONDON, E.C.

Inquiries from Retort Makers will be Esteemed.

A FREE TRIAL FOR ALL.
Agents Wanted.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

Cloth Bound, Price 3s. 6d., Post Free.

THE ROYAL COMMISSION ON THE METROPOLITAN WATER SUPPLY

—1892-3.—

Report of the Evidence (reprinted from the JOURNAL), with comments on the Inquiry, and the Commissioners' Conclusions and Recommendations.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

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STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

PETTIGREW'S PATENT
Sulphate of Ammonia Plant
ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Write for Particulars, Testimonials, and References to
GEO. PETTIGREW & Co.,
GAS AND CHEMICAL ENGINEERS,
MIDDLESBROUGH-ON-TEES.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
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THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON & COAL Co. Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

TELEGRAPHIC ADDRESS "CANNISTER, LONDON" TELEPHONE No. 4744.

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71, 72 & 73, BANKSIDE, SOUTHWARK, LONDON S.E.

GAS
Engineers & Contractors.
WATER
RETORT SETTING
MAIN LAYING
PLANS & ESTIMATES on APPLICATION.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

TROTTER, HAINES, & CORBETT,

Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY,
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LOW MOOR BLACK BED GAS COAL.

YIELD OF GAS PER TON	10,375 CUBIC FEET.
ILLUMINATING POWER	17·50 SPERM CANDLES.
COKE	75 PER CENT.

Prices, f.o.r. or f.o.b., on application to
GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

KENT'S THICK GAS COAL

RAISED AT
The Wharncliffe Woodmoor Colliery,
BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham, 8th August, 1894.

For Price, &c., apply to the
Wharncliffe Woodmoor Colliery Co LIMITED,
BARNSLEY;
Or to **Mr. W. H. HARVEY,**
17, Old Queen Street, Westminster, S.W.

WILLEY & CO.

GAS ENGINEERS & CONTRACTORS,

Central Works: Commercial Road, EXETER;

Meter Works: James Street, EXETER.

Telegraphic Address: "WILLEY, EXETER." Telephone No. 132.

Edison-Bell Phonograph Used.

Metropolitan Agent: CAPTAIN ACLAND, M.Inst.M.E., Assoc.M.Inst.C.E., DOCK HOUSE, BILLITER STREET, LONDON.

Manufacturers of every Requisite for Gas-Works.

Specialities: **GASHOLDERS, GAS-METERS, GAS-FITTINGS.**

WILLEY AND CO. beg to announce that they have recently acquired the Sole Right and Proprietorship of the

"SIMPSON"

Automatic Penny-in-the-Slot Meter

(By Royal Letters Patent),

An application of the "Vernier Principle," ensuring Mathematical Accuracy of Registration, combining all the latest Scientific Improvements

PRICE INSTANTLY, SIMPLY, & READILY ADJUSTED *IN SITU*, BY SINGLE FEET OR HALF FEET, WITHOUT CHANGE OF WHEELS.

STRENGTH, DURABILITY, & MINIMUM SIZE.

AMPLE WARNING & GRADUAL EXTINCTION.

BASE OR MISTAKEN COIN DETECTED & RETURNED.

Terms on Application.

NEW CATALOGUE OF GAS-FITTINGS of novel and registered designs, with Special Quotations to Gas Companies, now in the Press for early circulation.

Agents for the "MAXIM PATENT CARBURETTOR" New Process of Gas Enrichment by Carburine.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

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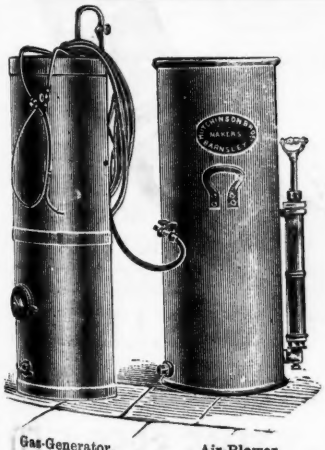

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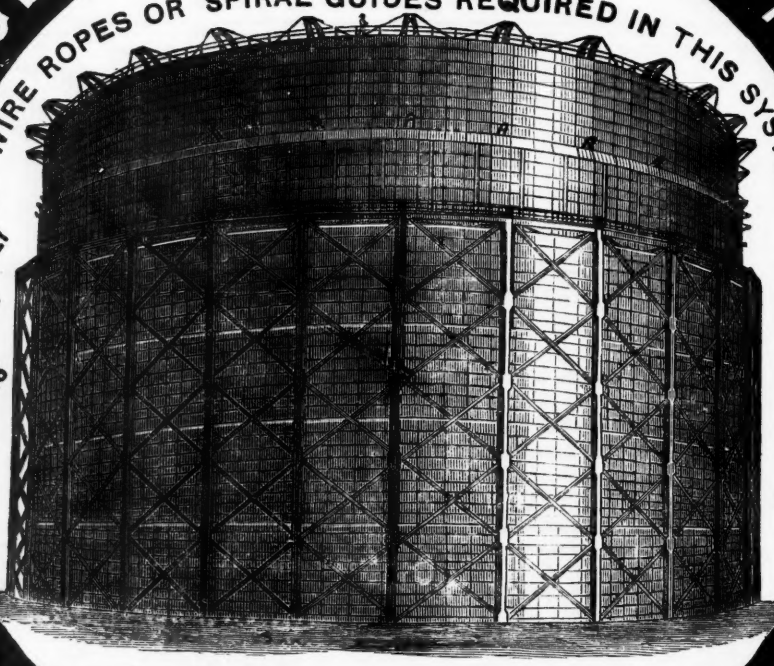

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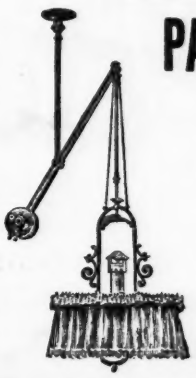

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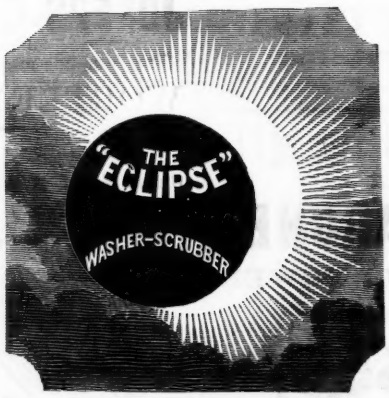

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